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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 24
DECEMBER 15, 1972

W72-14201 -- W72-15000

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 24
DECEMBER 15, 1972

W72-14201 — W72-15000

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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05 WATER QUALITY MANAGEMENT AND PROTECTION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

ANOMALOUS WATER AND OTHER POLYMERIC MATERIALS,
Maryland Univ., College Park. Center of Materials Research.
E. R. Lippincott, J. M. Casper, and P. Schuhmann.
Available from NTIS, Springfield, Va. 22151, as AD-739 673, Price $3.00 paper copy; 95 cents microfiche. Final Technical Report, March 1972. 42 p, 11 fig, 3 tab, 15 ref. DAAH 01-71-C-0639.

Descriptors: *Water chemistry, *Water types, *Polymers, *Synthesis, *Chemical reactions, Laboratory tests, Analytical techniques, Condensation, Gels, Silica, Water structure, Laboratory equipment.
Identifiers: *Polywater, *Anomalous water, Glass wool, Pyrex tubing, Glass tubing.

The preparation of anomalous materials by condensation in five capillaries was investigated under varied conditions of temperature, pressure and atmospheric composition. These experiments indicated that a saturated atmosphere of water vapor and a relatively high area of glass surface are primary requisites. Attempts were made to form anomalous materials by condensation on glass wool. Sodium methylcarbonate was isolated with methanol. The interaction of the room air (particularly the carbon dioxide) with the liquid and glass is important in the formation of anomalous substances. Anomalous materials were condensed directly from the air onto cold glass surfaces but not with cold plastic surfaces. This emphasized the role of glass. A possible explanation for the formation of anomalous materials on glass surfaces is that the first drops of liquid on the surface form basic sites which then condenses acidic substances from the air (primarily CO2) to form salts. Small amounts of silicon compounds may be involved to help produce the anomalous properties. (Woodard-USGS)
W72-14365

WATER PHENOMENA PHASE II: THEORETICAL STUDY OF WATER CLUSTERS AND A SEARCH FOR A NEW ALLOTROPE OF LIQUID WATER,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
P. L. M. Plummer.
Available from NTIS, Springfield, Va. 22151, as AD-735 152; Price $3.00 paper copy; 95 cents microfiche. Final Report, December 1971. 16 p, 8 ref. ONR Contract N00014-69A-0141-0002.

Descriptors: *Water chemistry, *Water types, *Water properties, *Silica, *Gels, Reviews, Chemical properties, Water structure, Pollutants, Laboratory tests, Evaluation.
Identifiers: *Anomalous water, *Polywater, Capillaries.

Studies performed in the attempt to produce and characterize anomalous water are summarized. It was concluded that the properties attributed to anomalous water were due to impurities, primarily silicates. Abstracts of seven papers concerning anomalous water are included. (Woodard-USGS)
W72-14366

THE VELOCITY DEPENDENCE OF THE TOTAL CROSS SECTION FOR ALKALI--WATER SCATTERING,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05A.
W72-14838

SOLUBILIZING EFFECTS OF AMIDE-WATER MIXTURES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05A.
W72-14843

02. WATER CYCLE

2A. General

SUBSURFACE HYDROGRAPH ANALYSIS BY CONVOLUTION,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 02F.
W72-14219

DEADLY SURGES IN THE BAY OF BENGAL: DYNAMICS AND STORM-TIDE TABLES,
Harvard Univ., Cambridge, Mass. Earth and Planetary Physics Center.
G. R. Flierl, and A. R. Robinson.
Nature, Vol 239, p 213-215, Sept. 22, 1972. 2 fig, 1 tab, 5 ref.

Descriptors: *Typhoons, *Surges, *Wind tides, *Flood forecasting, *Mathematical models, Waves (Water), Floods, Tropical cyclones, Weather patterns, Winds.
Identifiers: *Bay of Bengal, *India, *Bangladesh.

During the 1960's alone about 400,000 people died in the exceptionally high tides which swept in along the low lying northern coast of the Bay of Bengal under the force of tropical cyclones. Over half of these lives were lost in the single surge caused by the storm of November 1970. Such loss of life can be prevented only by depopulation of the area, construction of permanent defences, or by prediction of and protection against individual storms. The problem of sea level dynamics and prediction, was studied using simple mathematical models. Several factors amplify surge heights in the Bay of Bengal; the large (10-18 feet) astronomical tidal range, the large expanse of shallow water overlying the broad continental shelf, and the curvature of the coastline which focuses incoming storm-induced long waves. The maximum surge height occurs in response to a standard storm (W=100 knots, V=30 knots) run on straight line track as a function of track parameters, angle and landfall point. The maximum surge occurs shortly after landfall of the storm (within two hours but usually within one hour) and very near the landfall point (within 50 miles but usually closer than 20 miles). (Knapp-USGS)
W72-14367

SOME PROBLEMS WITH LOG-NORMAL MARKOV RUNOFF MODELS,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. J. Burges.
Proceedings, American Society of Civil Engineers, Journal of the Hydraulics Division, Vol 98, No HY9, Paper 9169, p 1487-1496, September 1972. 3 fig, 2 tab, 8 ref, append. OWRR C-1635 (No 3150) (5).

*Markov processes, *Water yield, *Mathematical models, *Probability, *Runoff forecasting, *California, Reservoir design, Stochastic processes, Statistical models, Simulation analysis, Synthetic hydrology, Model studies.
Identifiers: *Arroyo Seco (Calif).

Two methods for estimating the parameters of log-normally distributed runoff volumes employed in a lag one Markov model were investigated. In the first method the parameters were determined from the logarithms of the observed record. In the second method parameters were determined directly, by a method of moments, from the untransformed record. Both annual and monthly generation models were studied. Parameters for the flow record of Arroyo Seco, Calif. were estimated by both methods. Sequences were generated for both sets of parameters and used in a typical application, a storage reservoir capacity study. Storage requirements determined from these sequences differed significantly. (Knapp-USGS)
W72-14520

DETERMINATION OF THE RELATION BETWEEN SPRING DISCHARGE AND PRECIPITATION--AN APPLICATION TO SARIKIZ SPRINGS IN TURKEY,
Aegean Univ., Bornova (Turkey).
U. Ozis, and E. Benzeden.
In: International Association of Hydrogeologists Memoires, Vol 8, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 181-184, 1972. 2 fig, 4 ref.

Descriptors: *Springs, *Water yield, *Discharge (Water), *Stochastic processes, *Correlation analysis, Water balance, Precipitation (Atmospheric), Infiltration, Groundwater movement, Regression analysis.
Identifiers: *Sarikiz Springs (Turkey).

The recharge system and the discharge of springs are usually investigated through the use of hydrogeological elements, qualitatively, and through methods of deterministic hydrology, quantitatively. Methods of stochastic hydrology yield satisfactory results in cases where the fluctuations in the discharge are significant. The principal geologic formation of the recharge area of Sarikiz Springs of Turkey is karstic limestone. A linear relationship was determined through correlation between monthly average discharge of Sarikiz Springs and cumulative precipitation during the antecedent 12-month period over the probable recharge basin. This relationship is highly significant, even though the available data are very limited and the serial correlation effect was considerable. (Knapp-USGS)
W72-14602

A REVIEW OF THE STOCHASTIC APPROACH TO FLOW THROUGH POROUS MEDIA,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 02F.
W72-14610

VARIABILITY OF THE UNIT HYDROGRAPH,
For primary bibliographic entry see Field 02E.
W72-14614

THE CONTRIBUTION OF GLACIER ICE TO THE WORLD WATER BALANCE (A STATUS REPORT ON THE WORLD GLACIER INVENTORY),
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 02C.
W72-14715

THE INFLUENCE OF MAN ON THE HYDROLOGICAL CYCLE,
H. C. Pereira.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 553-569, 1 fig, 1 tab, 13 ref.

Descriptors: *Hydrologic cycle, *Land use, *Urbanization, Water conservation, Land development, Soil conservation, Land management, Water resources development, Watershed management, International Hydrological Decade.

'The Influence of Man on the Hydrological Cycle' is the title chosen by the Co-ordinating Committee of the International Hydrological Decade for a water resources study by a Working Group of the IHD. The most important influence of man is exerted through his use of land. The results of the study are given under the headings of Forest Lands, Grasslands, Arable Lands, Irrigation and Urbanization. Modern technology provides fully effective methods of developing land for all of the above uses, while incorporating protection of water resources. Desalination of seawater or of brackish ground water does not offer a viable alternative to watershed development. In the most developed countries methods for watershed protection and soil conservation are successfully adopted, but severe problems remain in urban and industrial areas of water pollution and disposal of waste products. In the developing countries watershed protection is failing at an alarming rate as natural vegetation cover is destroyed by unskilled subsistence agriculture. Both problems arise from the rapidly accelerating growth of human population. Implementation of the Group's recommendations must depend on political acceptance of public restrictions for the common good. In developing countries it is proposed that social, medical, economic and technical aid should be linked to land use improvement on a watershed basis and to the acceptance of essential restrictions of natural resources. (Knapp-USGS)
W72-14716

WATER AND ENERGY BALANCES OF DIFFERENT VEGETATION COVERS,
Munich Univ. (West Germany). Meteorologisches Institut.
For primary bibliographic entry see Field 02D.
W72-14717

PRELIMINARY RESULTS OF NEW INVESTIGATIONS OF WORLD'S WATER BALANCE,
Munich Univ. (West Germany). Meteorologisches Institut.
For primary bibliographic entry see Field 02D.
W72-14718

A SYNOPTIC STUDY FOR EVALUATING THE ROLE OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 02H.
W72-14719

WATER BALANCE AND FLOW STUDY IN THE BRAHMAPUTRA-GANGES BASIN OF EAST PAKISTAN,
East Pakistan Water and Power Development Authority, Dacca.
For primary bibliographic entry see Field 02E.
W72-14720

DISTINGUISHING SEASONAL RECHARGE TO GROUNDWATER BY DEUTERIUM ANALYSIS IN SOUTHERN ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 02F.
W72-14721

SEPARATION OF HYDROGRAPH COMPONENTS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
For primary bibliographic entry see Field 02E.
W72-14722

USE OF NEW TECHNIQUES FOR DETERMINING REGIONAL WATER BALANCES AND THEIR REPRESENTATION BY MATHEMATICAL MODELS (REFLEXIONS SUR L'UTILISATION DE TECHNIQUES NOUVELLES DANS L'ELABORATION DE BILANS HYDRIQUES REGIONAUX ET LEU R REPRESENTATION PAR MODELES MATHEMATIQUES),
International Association of Scientific Hydrology, Gentbrugge (Belgium). Surface Water Commission.
J. Jacquet.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 640-651. 5 ref.

Descriptors: *Water balance, *Reviews, *International Hydrological Decade, Forecasting, Water yield, Water demand, Water utilization, Climatology, Hydrologic cycle.

The methodology of working out water balances on a regional scale is discussed, taking into account the possibilities offered by modern methods of data collecting and processing, and also the limitations imposed by the practical aims of such operations. In any continental zone, determination of water balances is the necessary preliminary to preparation of prediction models based on the (present or future) level of consumption of the water resources of the region in question. For the prediction to take all factors into account, this obviously means that the regional water balance must be related to a global model depicting circulation of the atmospheric water on which replenishment of the resources depends. After problems are listed and the progress made in solving them is reviewed, a few lines of research are stressed because they look particularly promising for bringing out improvements in the efficiency of techniques for analyzing and representing hydrological phenomena. (Knapp-USGS)
W72-14723

ADAIR IHD EXPERIMENTAL BASIN NO 14, 1970.
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 04A.
W72-14729

WATER RESOURCES OF THE CROW WING RIVER WATERSHED, CENTRAL MINNESOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14743

INVESTIGATION OF TIME PARAMETER OF WATERSHEDS,
South Dakota State Univ., Brookings. Water Resources Inst.
S. T. Chu, and W. F. Lytle.
Available from the National Technical Information Service as PB-212 384, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Sept 1, 1971. 26 p, 10 fig, 1 tab, 8 ref, append. OWRR A-023-SDAK (1).

Descriptors: *Surface runoff, *Unit hydrographs, *Time of concentration, *Small watersheds, Peak discharge, *South Dakota, Storm runoff, Rainfall-runoff relationships, *Flood discharge.
Identifiers: Ungaged watersheds.

The base width of instantaneous unit hydrograph -- the time of base for thirty-five watersheds in South Dakota is investigated. This time parameter is correlated with the measurable physical properties of watersheds. A formula equation was derived which correlates the peak runoff and the duration of rainfall excess for a variable rainfall excess pattern. This formula augments theoretical developments in applying the ideas of unit hydrography theory and time of base to analyze runoff data. Based upon this correlation, a new method is developed to determine the flood discharge for ungaged watersheds with area less than 500 sq. miles in South Dakota.
W72-14918

STOCHASTIC SPACE-TIME MODELS OF THE RAINFALL-RUNOFF PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel, L. Duckstein, and J. L. Sanders.
Available from the National Technical Information Service as PB-212 387, $3.00 in paper copy, $0.95 in microfiche. Technical Completion Report, September 1972. 5 p. OWRR A-032-ARIZ (1).

Descriptors: *Flood forecasting, *Model studies, *Streamflow, Statistics, *Urban runoff, Watersheds (Basins), *Rainfall-runoff relationships, Water resources development, Arizona.
Identifiers: Tucson (Ariz).

The problem of forecasting the flow (floods and flow volumes) is approached from two vantage points: (a) use of basic stochastic hypotheses about thunderstorm patterns in space and time coupled to a simple rainfall-runoff model for a small basin so as to obtain a theoretical probability distribution of flow volumes, (b) use of a simple linear regression model relating flood peak to concurrent rainfall in the Tucson area as a basis for a Bayesian decision theoretic study of the worth of secondary data sources (rainfall) to augment information in the primary data (flood peak). The strength of the first approach rests on the goodness of the hypotheses and has the promise of generating classes of theoretical probability distributions of streamflow descriptors for the same descriptors. The approach gets away from use of multivariate hydrologic models for preserving second-order moment properties of rainfall and streamflow. The second but complementary vantage point looks at the hydrologic situation with small sample sizes as the decision maker might view it. Improvement in bridge pier design is obtained as a result of using the secondary data source. The focus is on the decision to be made with the aid of the data and not on model building for its own sake. However, both vantage points should gradually converge as stochastic models become more representative of flow on different parts of the drainage net.
W72-14922

STABLE ISOTOPE SURVEY OF THE FRESH WATER OCCURRENCES IN ISRAEL AND THE NORTHERN JORDAN RIFT VALLEY,
Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept.
For primary bibliographic entry see Field 02K.
W72-14945

EFFECT OF CATCHMENT AREA ON FLOOD MAGNITUDE,
Australian Rivers and Water Supply Commission, Victoria, New South Wales.
G. N. Alexander.
Journal of Hydrology, Vol 16, No 3, p 225-240, July 1972. 8 fig, 1 tab, 49 ref.

Descriptors: *Rainfall-runoff relationships, *Regression analysis, *Rational formula, Precipitation intensity, Runoff coefficient, Watersheds (Basins), Peak discharge, Design flow, Duration curves, Stochastic processes.

The estimation of the exponent in the common power-type formula relating flood flow to catchment area yields values ranging from 1/2 (Meyer-Jarvis) to 1 (Rational formula), all in common use. To reduce this range it is essential to distinguish between values obtained by regression analysis from those obtained using an envelope. From examination of values based on regression, estimates depend on the range of area sizes, rainfall frequency, and climate. The average of exponents in the three power-type formulae relating rainfall intensity with duration; duration or lag with area A; or flood intensity with rainfall intensity, is 0.7. (Knapp-USGS)

W72-14946

ROLE OF BASEFLOW IN RAINFALL-RUNOFF RELATIONS,
Illinois State Water Survey, Urbana.
K. P. Singh.
Water Resources Bulletin, Vol 8, No 4, p 813-824, August 1972. 4 fig, 3 tab, 3 ref.

Descriptors: *Base flow, *Rainfall-runoff relationships, *Water yield, *Flood forecasting, Runoff forecasting, Storm runoff, Peak discharge, Hydrogeology, Hyetographs, Hydrographs, Hydrograph analysis, Recession curves, Regression analysis, Correlation analysis, Data collections, Soil moisture, Evapotranspiration, *Illinois.
Identifiers: *Base flow (Initial).

The role of initial baseflow, or the baseflow at the beginning of storm precipitation, in modifying mathematical rainfall-runoff relations was analyzed by using data from 95 storms over a drainage basin in Illinois. A regression model used total runoff, surface runoff, baseflow runoff, and peak flow as dependent variables, and storm precipitation, initial baseflow, effective and total storm durations, and temperatures as independent variables. Storm precipitation and initial baseflow are the most important variables for making dependent variable estimates. The standard error estimates using only storm precipitation and initial baseflow as predictors show a seasonal trend with a peak in July, August, or September. An understanding of the role of baseflow as an indicator of average soil moisture condition over the basin can be of great help in short-term reservoir regulation and flood warning. (Knapp-USGS)
W72-14955

WATER RESOURCES APPLICATIONS OF STREAM CHANNEL CHARACTERISTICS ON SMALL FORESTED BASINS,
Pennsylvania State Univ., University Park. School of Forest Resources.
D. R. DeWalle, and A. Rango.
Water Resources Bulletin, Vol 8, No 4, p 697-703, August 1972. 3 tab, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Variability, *Alluvial channels, *Channel morphology, Geomorphology, Discharge (Water), Water yield, Runoff forecasting, Runoff, Hydrogeology, Streamflow forecasting.

Stream channel characteristics are useful indices to the hydrology of 27 small forested basins in the Northeast United States. Channel width alone explains 37 percent of the variation in mean annual runoff, and channel width combined with basin area explains 78 percent of the variation. Mean annual precipitation explains 83 percent. A simulated 15% increase in precipitation, such as might occur in a weather modification project, produced increases in channel width, depth, and channel area of 3, 4, and 8 percent, respectively. (Knapp-USGS)
W72-14966

2B. Precipitation

ATMOSPHERIC WATER RESOURCES RESEARCH,
Fresno State Coll., Calif.
For primary bibliographic entry see Field 03B.
W72-14232

RESEARCH IN NUMERICAL ANALYSIS TECHNIQUES FOR MODEL SIMULATION,
Digital Programming Services, Inc., Waltham, Mass.
R. C. Serbagi.
Available from NTIS, Springfield, Va., 22151, as AD-740 967. Price $3.00 paper copy; $0.95 microfiche. Air Force Cambridge Research Laboratories Final Research Report AFCRL-71-0581, November 15, 1971. 37 p, 4 ref. Contract No F19628-69-C-0178.

Descriptors: *Computer models, *Cloud physics, *Meteorological data, *Fog, *Numerical analysis, Condensation, Computer programs, Methodology, Drops (Fluids), Evaporation.

A computer model is given for the numerical solution of the partial differential equations governing the transport and condensation processes of clouds. The models include two-dimensional warm fog seeding, one-dimensional cumulus cloud formation, and three-dimensional warm fog modification by external heat sources. The finite difference techniques used and the stability criteria are discussed. The method of calculating, the condensation/evaporation rates, and the diffusion parameters are also given. In addition, a series of computer programs, data reduction techniques, and data analysis procedures were developed to recover pertinent data from various recording media generated on C-130 aircraft. The meteorological data collected were reduced into a usable form such that computer studies can be made relative to the growth, structure, and modification techniques of convective clouds. (Woodard-USGS)
W72-14358

DEADLY SURGES IN THE BAY OF BENGAL: DYNAMICS AND STORM-TIDE TABLES,
Harvard Univ., Cambridge, Mass. Earth and Planetary Physics Center.
For primary bibliographic entry see Field 02A.
W72-14367

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION,
Transportation Systems Center, Cambridge, Mass.
For primary bibliographic entry see Field 07B.
W72-14372

LARGE SCALE EFFECTS OF CLOUD SEEDING--1970-1971 SEASON AND FOUR YEAR SUMMARY,
Aerometric Research, Inc., Geoleta, Calif.
For primary bibliographic entry see Field 03B.
W72-14538

WATER RESOURCES OF NORTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14540

FLOODS OF AUGUST 1967 IN EAST-CENTRAL ALASKA, WITH A SECTION ON WEATHER FEATURES CONTRIBUTING TO THE FLOODS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-14725

EVALUATION OF THE STREAMFLOW-DATA PROGRAM IN HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02E.
W72-14737

FORECASTING PRECIPITATION TYPE AT GREER, SOUTH CAROLINA,
National Weather Service, Columbia, S.C.
J. C. Purvis.
Available from NTIS, Springfield, Va. 22151 as COM-72-10332, Price $3.00 paper copy; $0.95 cents microfiche. National Oceanic and Atmospheric Administration Technical Memorandum NWS-ER-44, 1971. 8 p, 2 fig, 3 tab, 4 ref.

Descriptors: *Weather forecasting, *Precipitation (Atmospheric), *Meteorology, *Synoptic analysis, *South Carolina, Analytical techniques, Weather data, Meteorological data, Rainfall, Snowfall, Sleet.
Identifiers: *Precipitation types, *Greer (SC).

Using the predictors recommended by Younkin, an objective technique in the form of a nomograph has been developed for forecasting precipitation type at Greer, S.C. A test on independent data showed that this technique produces results at least as good as the forecasts released to the public. The objective technique can help overcome an apparent reluctance of forecasters to forecast frozen or freezing precipitation at Greer until it is observed. The Younkin method relates both the 1000 - 850 mb. and the 850 - 700 mb. thickness to type of precipitation. The technique as applied for Greer relates the 0000Z observed thickness data to the type of precipitation that occurs the following calendar day, which begins at 0500Z. To make the technique completely objective, an arithmetic mean of the Athens, Georgia, and Greensboro, North Carolina, radiosonde data is used, without any adjustments. (Woodard-USGS)
W72-14741

EVALUATION OF WARM-FOG ABATEMENT CHEMICALS,
Naval Weapons Center, China Lake, Calif.
E. E. Hindman, II, and R. S. Clark.
Available from NTIS, Springfield, Va. 22151, as AD-740 640 - Price $3.00 paper copy; $0.95 cents microfiche. Department of Transportation, Federal Aviation Administration Report FAA-RD-72-21, 1972. 31 p, 4 fig, 2 tab, 22 ref. DOT FAA72WA1.

Descriptors: *Fog, *Abatement, *Chemicals, *Methodology, *California, On-site tests, Drops (Fluids), Heating, Meteorology, Precipitation (Atmospheric), Evaporation, Humidity.
Identifiers: *Fog-abatement chemicals, *Glycerine, Warm fog, Fog dissipation.

Dow Chemical Company demonstrated that glycerine, diethylene- and tetraethylene-glycol were promising warm-fog abatement chemicals. The FAA requested that the fog-abatement properties of these chemicals be evaluated during the NWC Project Foggy Cloud IV, Humboldt County, California. Nineteen micron glycerine droplets were sprayed at 21 gal/acre into a 250 ft deep stratus deck from a tethered hot-air balloon. The heat from the balloon cleared the first 50 ft of the deck and the glycerine droplets cleared a 178 ft diameter hole through the remaining 200 ft. The droplets cleared the hole by reducing the relative humidity in the stratus deck which caused the stratus droplets to evaporate. (Woodard-USGS)
W72-14747

CLIMATOLOGIC TRAITS OF EASTERN PARAGUAY,
Asuncion Univ. (Paraguay). Faculty of Agronomy.
Teofilo Farina Sanchez.
Bol Soc Argent Bot. 11 (Suppl.): p 111-119. 1970.
Identifiers: *Climatology, *Paraguay, *Humidity.

The factors of sunshine, temperature, evaporation, dew, rain, wind, storms, frost, fog and dust storms are analyzed. A breakdown of different climates within the area distinguishes between tropical subhumid climate with deficient humidity in winter; mesothermal humid with deficient humidity in winter; mesothermal subhumid with adequate year-round humidity.–Copyright 1972, Biological Abstracts, Inc.
W72-14906

THE ROLE OF ELECTRICAL FORCES IN THE DEVELOPMENT AND DISSIPATION OF CLOUDS AND FOGS,
University of Manchester Inst. of Science and Technology (England).
J. Latham, and M. H. Smith.
Available from NTIS, Springfield, Va. 22151 as AD-737 728 - Price $3.00 paper copy; $0.95 cents microfiche. Final Technical Report, November 1971. 37 p, 22 fig, 61 ref. DAJA37-71-C-1117.

Descriptors: *Cloud physics, *Electrical properties, *Dropwise condensation, *Weather modification, *Rainfall, Fog, Meteorology, Model studies, Meteorological data, Atmospheric physics, Clouds, Mathematical studies, Analytical techniques.
Identifiers: *Cloud dissipation, *Fog dissipation.

Cloud physics studies provide data concerning the coalescence efficiencies of water drops; the production of satellite droplets by colliding water drops and the resulting effect upon rainfall rate; the influence of electric forces upon the interaction of cloud droplets; and calculation of the effectiveness of various hygroscopic materials as fog modification agents. The studies of the interactions of colliding water drops comprise the main body of the report. The results of computations utilizing a model of the movement of charged droplets under the influence of their charges are presented graphically. The main features of the graphs are the reversal positions of the electric field and the droplet velocities. The electric force and gravitational force on the particles nearly cancel out leaving a very low remaining force. The electric fields produced are quite large even in the case of the spraying of relatively small amounts of material. (Woodard-USGS)
W72-14963

2C. Snow, Ice, and Frost

COARSE SEDIMENT TRANSPORT BY FLOOD FLOWS ON KNIK RIVER, ALASKA,
Colorado Univ., Boulder. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W72-14207

DEEP EROSION BY CONTINENTAL ICE SHEETS,
North Carolina Univ., Chapel Hill. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-14208

TURBIDITE MUDS WITHIN DIATOM OOZE OFF ANTARCTICA: PLEISTOCENE SEDIMENT VARIATION DEFINED BY CLOSELY SPACED PISTON CORES,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-14209

VERTICAL MIXING OF ICE-RAFTED VOLCANIC ASH IN NORTH ATLANTIC SEDIMENTS,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 02J.
W72-14210

ALPINE SUBNIVAL BOULDER PAVEMENTS IN COLORADO FRONT RANGE,
Ohio State Univ., Columbus. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-14229

MEANDERING HABIT OF SUPRAGLACIAL STREAMS,
Sheffield Univ. (England). Dept. of Geography.
A. D. Knighton.
Geological Society of America Bulletin, Vol 83, No 1, p 201-204, January 1972. 2 fig, 1 tab, 7 ref.

Descriptors: *Meanders, *Melt water, *Glaciers, *Channel morphology, *Glaciohydrology, Ice, Melting, Geomorphology, Hydraulics, Streamflow, Discharge (Water).
Identifiers: *Supraglacial streams.

There is a general similarity in the form of meanders developed in alluvial valleys and on glacier ice, despite large differences in environmental conditions. As measurements were made only two months after the beginning of the snow-melt, time does not appear to be an important element in the attainment of a mean meander geometry where the stream is free to develop its planimetric form in the abence of severe physical constraints. Nor do differences in scale seem to affect the relations; meanders are shaped to maintain a proportionality between the form parameters themselves and between those parameters and the size of the channel. These considerations indicate the importance of flow dynamics in meander formation and lend support to the contention that meanders develop in response to the action of a general physical principle. The value of studying supraglacial streams lies in the fact that the adjustment of form to process takes place relatively rapidly in conditions which are free from some of the constraints imposed on alluvial rivers. (Knapp-USGS)
W72-14231

MEASUREMENTS OF ULTRASONIC WAVE VELOCITIES IN ICE CORES FROM GREENLAND AND ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
H. F. Bennett.
Research Report 237, June 1972. 58 p, 53 fig, 61 ref. Contract DA-49-092-ARO-40.

Descriptors: *Ice cover, *Sound waves, *Ultrasonics, *Arctic, *Antarctic, Anisotropy cores, Isotropy velocity, Measurement, Instrumentation, Methodology, Analytical techniques, Model studies, Profiles, Crystals, Correlation analysis.
Identifiers: *Greenland, *Antarctica, *Ice cores, Acoustic birefringence.

Detailed ultrasonic velocity measurements were made on snow and ice cores from Greenland Antarctica to study velocity anisotropy and its relationship to the petrofabric analysis of these cores. In addition, ultrasonic velocities were measured in the near-surface snow layers at Byrd Station and South Pole Station, Antarctica, to provide detailed velocity profile in the region of the ice sheet where velocity is greatly influenced by the snow structure. The design of equipment, measurement errors, techniques, and problems encountered in the study are discussed. The theory of wave propagation in a general anisotropic medium is reviewed and a detailed presentation of this theory, concerning transversely isotropic media, is given. A method is developed for calculating a theoretical velocity model from the petrofabric analysis of the ice cores, thus providing a means of testing the theory with field and laboratory observations. There is good agreement between the theoretical velocity models based on the petrofabric ice core analysis and the observed seismic and ultrasonic shear-wave velocity observations, but poorer agreement with the compressional wave velocities. (Woodard-USGS)
W72-14521

THE CONTRIBUTION OF GLACIER ICE TO THE WORLD WATER BALANCE (A STATUS REPORT ON THE WORLD GLACIER INVENTORY),
McGill Univ., Montreal (Quebec).
F. Mueller, and C. S. L. Ommanney.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 539-553, 2 fig, 4 tab, 38 ref.

Descriptors: *Water balance, *Glaciers, *Data collections, *Canada, *International Hydrological Decade, Hydrology, Surveys, Networks, Hydrologic data, Data processing.

This paper reviews the UNESCO/IASH guide for a world glacier inventory and the three pilot studies carried out on the basis of the guide's recommendations, and reports, using Canada as an example, on the problems and progress of one of the countries most advanced in its IHD glacier inventory work. After a brief mention of some of the efforts being made to implement this guide in many other countries, some of the limitations, difficulties and potentials are discussed. Plans for an International Technical Secretariat for global data compilation and analysis are mentioned. (Knapp-USGS)
W72-14715

AN EARTH FILL DAM ON PERMAFROST: HESS CREEK DAM, LIVENGOOD, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 08D.
W72-14939

GLACIOLOGICAL INVESTIGATIONS IN ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. J. Gow.
Antarctic Journal of the United States, Vol 7, No 4, p 100-101, July-August 1972. 2 fig.

Descriptors: *Glaciers, *Antarctic, *Sediment transport, Sedimentation, Provenance, Glaciation, Regimen, Dusts, Sands, Gravels.
Identifiers: Royal Society Range (Antarctica).

Glaciers along the southern foothills of the Royal Society Range, Antarctica were studied to observe the debris patterns in the glaciers and to learn the mechanisms of their emplacement. Sites visited included eight alpine glaciers-Walcott, Adams, Miers, Joyce, Garwood, Hobbs, Blue, and Commonwealth-and a single outlet glacier, Taylor. All the glaciers contained laminations made up of fine sand and dust. Such debris tended to be concentrated into zones up to 3 meters thick and as many as four laterally extensive zones were identified in several of the glaciers. Deposition of dust and sand occurred on a periodic basis. Most of the debris was probably derived by wind from sources of exposed rock in the Royal Society Range. Some of the debris may be volcanic ash. Additionally, the Garwood, Blue, and Taylor Glaciers all contain thick sequences of sand and gravel intercalated with bubbly glacial ice. Though obviously distorted by englacial deformation, these deposits still possess characteristic features of water-laid deposits. This debris was originally deposited on top of the glaciers (in their accumulation areas) by melt streams or by avalanching during some period of ablation much more intensive than the present. This period of ablation could be correlated with the climatic optimum of several thousand years ago. (Knapp-USGS)
W72-14940

OGIVE SYSTEMS ON POLAR ALPINE GLACIERS,
Ohio State Univ., Columbus. Inst. of Polar Studies.
M. J. McSaveney.
Antarctic Journal of the United States, Vol 7, No 4, p 101-102, July-August 1972. 4 ref. NSF Grant GV-28804.

Descriptors: *Glaciers, *Antarctic, *Movement, *Rheology, Ablation, Regimen, Glaciation, Surveys.

To test various models of glacial ogive formation and to find out how wave ogives are formed and

modified under polar alpine conditions, closely spaced surface strain networks were erected on the ogive train of Meserve Glacier, Antartica, deep and shallow bore holes were placed within these networks, ice samples were taken for fabric studies, and areal variation in ablation was studied. In addition, other ogive systems in the McMurdo Sound region were observed. The Meserve Glacier ogive train is not a single train of waves but a system of two interdigitating trains symmetrically disposed about the center-line. Well developed ogive trains were located on polar-facing alpine glaciers in the valley of the Ferrar Glacier and in Pearse Valley. Poorly developed ogives of polar orientation were observed in Taylor and Wright Valleys. Strain variation over ogive systems is large and consistent with the ogive pattern. The largest wave form on Meserve Glacier is now a recumbent fold, flattening under gravity. (Knapp-USGS)
W72-14941

DEEP LAKE, CAPE BARNE, ANTARCTICA,
Institute of Nuclear Sciences, Lower Hutt (New Zealand).
C. H. Hendy, M. J. Selby, and A. T. Wison.
Limnology and Oceanography, Vol 17, No 3, p 356-362, May 1972. 7 fig, 5 ref.

Descriptors: *Lakes, *Antarctic, *Lake ice, *Paleoclimatology, *Paleohydrology, Geomorphology, Water temperature, Water chemistry, Limnology, Glaciation, Freezing, Melting.
Identifiers: *Deep Lake (Antarctica).

Microrelief on the ice of Deep Lake, Ross Island, Antarctica, is caused by differential ablation. A 3.3 m high ice cone was formed by tilting of ice blocks beneath a gravel cover of varying thickness. The temperature of the lake water beneath the ice is a result of solar heating. Chemical stratification is an indication that there was an arid period in the recent past. (Knapp-USGS)
W72-14958

2D. Evaporation and Transpiration

PLANT POPULATION EFFECTS ON THE EFFICIENT USE OF WATER: WATER UPTAKE CHARACTERISTICS,
Agricultural Experiment Station, Stillwater. Okla.
For primary bibliographic entry see Field 03F.
W72-14433

STOMATAL RESISTANCE AND TRANSPIRATION POTENTIAL OF BOG PLANTS,
New Hampshire Univ., Durham. Dept. of Soil and Water Science.
P. J. Marchand.
M.S. Thesis, May 1972. 57 p, 3 tab, 7 fig, 32 ref. OWRR A-015-NH (2).

Descriptors: *Transpiration control, *Evapotranspiration, *Water yield improvement, Soil-water-plant relationships, Bogs, Stoma.
Identifiers: *Stomatal resistance, *Bog plants, Transpiration potential.

Control of vegetative ground cover offers one means of regulating evapotranspiration losses and increasing watershed yield. In order to identify species differences in water use, key resistances in the transpiration pathway were studied, under common field conditions. Stomatal diffusion resistance was compared among ten wetland species with three-fold differences noted. Xylem tensions were measured with a pressure bomb as a means of inferring species differences in internal resistance to water movement. Diurnal trends showing progressive stomatal closure throughout the day in some species but not in others, indicates important differences in water-use patterns, possibly related to liquid-phase resistances. It is concluded that the magnitude of species differences in 'effective' stomatal resistance under field conditions is significant in terms of resulting soil-water depletion. Furthermore, making such comparisons with the diffusion porometer remains a practical means of surveying watershed vegetation.
W72-14543

HYDROLOGICAL STUDIES OF EVAPOTRANSPIRATION AND GROUNDWATER FLOW IN SANDY LAND,
R. Kaneko.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 140-144, 1972. 5 fig.

Descriptors: *Evapotranspiration, *Water balance, *Sand dunes, Infiltration, Groundwater movement, Saline water intrusion, Urbanization, Industrial water, Water table, Hydrogeology.
Identifiers: Hiratsuka (Japan).

The groundwater level was recorded from 1953 through 1965 at the observation field in Hiratsuka, Japan, and a water balance calculation around the field was performed to estimate groundwater flow and evapotranspiration. No surface flow takes place near the field. Soil moisture, groundwater level, and evapotranspiration from lysimeters were measured at the investigation site in addition to meteorological observation. During the period, the increase of population and the development of industry in Hiratsuka caused a rapid increase of pumped discharge of groundwater. Accordingly, the groundwater level in deep wells gradually fell, and also the unconfined groundwater table was lowered owing to percolation into deeper strata. Transpiration from sandy land is estimated by providing precipitation, groundwater flow, groundwater stage, and the relationship between groundwater level and its drawdown corresponding to the change of environments. The value of evapotranspiration indirectly obtained by water balance calculation on an area in question better represents the true evapotranspiration of the area than direct measurement in such a limited plot as lysimeters. (Knapp-USGS)
W72-14599

WATER AND ENERGY BALANCES OF DIFFERENT VEGETATION COVERS,
Munich Univ. (West Germany). Meteorologisches Institut.
A. Baumgartner.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 570-580 6 fig, 1 tab, 9 ref.

Descriptors: *Water balance, *Climatology, *Land use, *Evapotranspiration, Water utilization, Consumptive use, Vegetation effects, Evaporation, Snowmelt, Thermodynamics, International Hydrological Decade.

Using the thermodynamics of evaporation, the rate at which evaporation can be influenced by man's activity to change the earth surfaces is calculated. Evaporation increases with growing plant mass of the soil covers. The potentials to change the water balance of continents, oceans, and the globe are evaluated. The possibility of changing the water balance by altering the vegetated part of the earth's surface is extremely small, of the order of only about 001%. (Knapp-USGS)
W72-14717

PRELIMINARY RESULTS OF NEW INVESTIGATIONS OF WORLD'S WATER BALANCE,
Munich Univ. (West Germany). Meteorologisches Institut.
A. Baumgartner, and E. Reichel.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 581-592, 1 fig, 2 tab, 39 ref.

Descriptors: *Water balance, *Climatology, Evaporation, Precipitation (Atmospheric), Reviews, Runoff, Hydrologic cycle, International Hydrological Decade, Evapotranspiration.

Methods and results of recent investigations to improve the certainty of numerical data of global water balance as well the partition of water to continents, oceans and latitudinal zones are reviewed. A new detailed precipitation chart was drawn. A chart of the level of stream discharge was drawn on a similar scale as the map of precipitation, on the basis of the published numerical values. A chart of the evaporation quantities was calculated on a climatological basis from the methods and values given by Thornthwaite. The three maps for precipitation, runoff, and evaporation are used for a mutual control. Evaluation of evaporation from seas is possible at the present state with higher reliability than of the precipitation. The evaluation of evaporation on the seas results from considerations of vapor exchange and from investigations of the heat balance by calculating the latent heat for evaporation. (Knapp-USGS)
W72-14718

RELATIONSHIPS BETWEEN THE AMOUNT OF TRANSPIRATION AND THE STOMATE OPENING OF SOME PHANEROPHYTES FROM THE ZAGREB FOREST (YUGOSLAVIA),
Institut za Botaniku, Zagreb (Yugoslavia).
Mihovil Gracanin, and Ljudevit Ilijanic.
Biol Glas. Vol 21, No 1-4, p 137-149. 1968 (1969). Illus.
Identifiers: *Transpiration, *Stomata, Acer pseudoplatanus D, Carpinus betulus D, Corylus avellana D, Fagus sylvatica D, Forests, Fraxinus excelsior D, Opening, Phanerophytes, Quercus petraea D, Relationships, Sambucus racemosa D, Yugoslavia.

Under natural conditions no definite causal relationship between transpiration values and stomate size was ascertained because these are affected by external physical and internal physiological factors. In some species (Corylus avellana, Quercus petraea, Fraxinus excelsior and especially Acer pseudoplatanus and Sambucus racemosa) the stomata never completely close during the day or during the vegetation season (May 23 to Oct. 2). The stomata of Carpinus betulus and especially of Fagus sylvatica are often closed in the early morning and late afternoon. It appears that the condition of the stomate is highly dependent on light intensity and turgidity of the stomate cells, while transpiration is not only determined by the size of the stomate opening, but more by the water vapor potential between the leaf blade and the atmosphere. From spring to fall the structure of the epidermal cells changes and with it the transpiration capacity.--Copyright 1972, Biological Abstracts, Inc.
W72-14828

PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF PLANTS TO DIFFERENT INTERNAL WATER POTENTIALS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 02I.
W72-14835

COMPARISON OF LYSIMETER AND NEUTRON SCATTER TECHNIQUES FOR MEASURING EVAPOTRANSPIRATION FROM SEMIARID RANGELANDS,
Agricultural Research Service, Sidney, Mont.
J. R. Wight.
J Range Manage. Vol 24, No 5, p 390-393. 1971. Illus.

Identifiers: *Evapotranspiration, *Measurement, Semiarid climates, Flux, Lysimeters, Percolation, Rangelands, Runoff, Soil water.

Evapotranspiration (ET) calculated from changes in soil water content measured by the neutron scatter method was compared to ET measured by lysimetry. During 1968, a near-average precipitation year (33 cm), the neutron method was effective for determining ET over periods of 4 wk or longer. Cumulative ET curves as determined by lysimetry and the neutron method were in excellent agreement. In 1969, a year with high precipitation in June and July, reliability of the neutron method was severely limited by deep percolation and possibly by surface runoff. Failure of the neutron method to measure accurately water content near the soil surface following periods of precipitation was the major source of error when percolation and runoff were not factors. Sensitivity of the neutron method during a 30-day drying cycle was equal to that of a hydraulic lysimeter. Upward soil water fluxes were evident and are potential sources of error.--Copyright 1972, Biological Abstracts, Inc.
W72-14862

A NOTE ON THE MEASUREMENT AND ESTIMATION OF EVAPORATION,
R. W. Gloyne.
Meteorological Magazine, Vol 100, p 322-328. 1 fig, 16 ref. (1971).

Descriptors: *Evaporimeters, *Evaporation, *Evaporation pans, *Water loss, Transpiration, Evapotransportation, Transpiration control, Climatology, Microclimatology, Analytical techniques, Measurement.

In a given macro-meteorological situation, the rate of water-loss per unit area from a device such as a pan, a small pond, or from an isolated small area can, and generally does, differ systematically in varying degrees from the corresponding rate of water loss from an extensive, homogeneous vegetated surface. Causes of the differences between the rate of water loss from an evaporimeter and that from an extended, freely evaporating area are discussed. Theoretical expressions of the evaporation rate from a strip and a circular area are examined to clarify the problem. Attention is directed to the leading edge effect and to the oasis effect. Field results are included to help illustrate these effects. (Black-Arizona)
W72-14879

MEASURED AND PREDICTED EVAPORATION AT PASAJE, ECUADOR,
M. R. Hasan, and P. S. Jones.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR3, p 511-516, September 1972. 1 fig, 4 tab, 7 ref.

Descriptors: *Evapotranspiration, *Consumptive use, *Crops, *Tropical regions, South America, Humid areas, Evaporation, Evaporimeters.
Identifiers: *Bananas, *Ecuador.

To determine the water requirements of bananas and certain other crops in the coastal region of the Jubones River basin, southern Ecuador, a study was made of the measured and computed evaporation regimes based on the Class A pan, Piche evaporimeter and climatic data covering 84 months at one station in the project area. Both the Thornthwaite and Blaney-Criddle methods appear to overestimate evaportranspiration. The application of these formulas, without any modification to suit the climatic anomalies of the area, can be justified only if a high degree of approximation is acceptable in calculating water requirements of bananas or any other crop. (Knapp-USGS)
W72-14952

2E. Streamflow and Runoff

ENVIRONMENTAL CONSTRAINTS ON THE SUBSTITUTION OF SPACE FOR TIME IN THE STUDY OF NATURAL CHANNEL NETWORKS,
Alberta Univ., Edmonton. Dept. of Geography.
A. D. Abrahams.
Geological Society of America Bulletin, Vol 83, No 5, p 1523-1529, May 1972. 4 fig, 2 tab, 20 ref.

Descriptors: *Geomorphology, *Drainage patterns (Geologic), *Drainage density, Terrain analysis, Statistics, Topography, Channel morphology, *Australia.
Identifiers: *Stream channel networks.

Data for stream frequency and drainage density were gathered from five fluvially eroded landscapes in eastern Australia. Growth models may be defined only for basins of a given order in a particular landscape. Laws of change through time (growth laws) involving any drainage basin morhpometric property that is functionally related to the random development of channel networks may be represented by laws of change over space only where the sampled basins are of the same order (or magnitude) and experience similar environments. For real channel networks, variability density originates in systematic variations in the environment and apparently random development of channel networks. (Knapp-USGS)
W72-14203

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 08B.
W72-14205

MEANDERING HABIT OF SUPRAGLACIAL STREAMS,
Sheffield Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W72-14231

DIGEST OF THE CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W72-14234

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1971,
Geological Survey Helena, Mont.
For primary bibliographic entry see Field 07C.
W72-14235

FIELD OBSERVATIONS OF WAVE RUNOFF ON A SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 07C.
W72-14362

A SUMMARY OF PEAK STAGES AND DISCHARGE IN MARYLAND, DELAWARE, AND DISTRICT OF COLUMBIA FOR FLOOD OF JUNE 1972,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 07C.
W72-14369

PREDICTION OF COLUMBIA RIVER TEMPERATURES DOWNSTREAM FROM GRAND COULEE DAM FOR WIDE EXTREMES OF FLOW AND WEATHER CONDITIONS,
For primary bibliographic entry see Field 04A.
W72-14402

WIND DRIVEN WATER CURRENTS,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08B.
W72-14412

SOME PROBLEMS WITH LOG-NORMAL MARKOV RUNOFF MODELS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14520

EFFECTS OF THE JANUARY AND FEBRUARY 1969 FLOODS ON GROUND WATER IN CENTRAL AND SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-14525

QUALITY OF SURFACE WATER IN THE BEAR RIVER BASIN, UTAH, WYOMING, AND IDAHO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14539

WATER RESOURCES DATA FOR NEW YORK, 1971: PART 1. SURFACE-WATER RECORDS.
Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 07C.
W72-14609

VARIABILITY OF THE UNIT HYDROGRAPH,
P. Light.
Available from NTIS, Springfield, Va 22151 as COM-72-10363 Price $3.00 paper copy; $0.95 microfiche. NOAA, National Weather Service, Final report, December 1971. 42 p, 7 fig, 17 tab, 14 ref. Project No 0211912 NOAA Contract E-191-69 (N).

Descriptors: *Storms, *Precipitation (Atmospheric), *Rainfall-runoff relationships, *Unit hydrographs, *Model studies, Computer programs, Statistical methods, Variability, Hydrologic data, Analytical techniques, River forecasting, Storm runoff, Urbanization.

Statistics were collected on the variability of the unit hydrograph from storm to storm, and the factors responsible for the variations were evaluated. The 12 drainage basins selected for study are located in Missouri, Illinois, and Louisiana. The selections were based on size of drainage area, length and quality of automatic recording rainfall and streamflow records, and absence of significant stream regulation or urbanization. Computer programs are described, and an analysis of different systems of unitgraphs is presented. The functions selected for unitgraph derivation are based on the surface runoff models conceived by Clark, Nash and Dooge. The 2-parameter Nash function provides a satisfactory fit of the unit hydrograph, and is superior to the Clark function. (Woodard-USGS)
W72-14614

MODELS FOR THE SYNTHESIS OF MONTHLY STREAMFLOWS FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
D. H. Moreau.
(1972). 24 p, 13 tab, 14 equa, 4 append.

Descriptors: *North Carolina, *Simulation analysis, *Equations, *Digital computers, *Streamflow, Monthly, Forecasting, Gaging stations, Design, Alternative planning, Water resources development, Regional analysis, Regression analysis, Flow characteristics, Urban hydrology, Mathematical models, Systems analysis.
Identifiers: *Piedmont, *Conservation of mass.

Constructed are sample sequences of monthly streamflow at several locations in a portion of the North Carolina Piedmont Region for the purpose of simulating the behavior of several alternative designs for a regional water resource system to serve the needs of urban areas. The simulation models consist of a system of equations that express the principle of conservation of mass for a particular system design and a set of logical statements that specify how the system is to be operated under all possible circumstances that could arise within the context of the model. By routing sequences of flows through the model on a digital computer and tabulating the response of selected output variables, it is possible to predict, in the form of probability statements, what the future behavior of a particular system will be under a specified operating policy. The approach taken here is to use the historical data to identify and to calibrate a model for streamflows which can then be used to generate an arbitrary number of new sequences of flows each of arbitrary length. Multivariate linear regression models are used to represent flows in the region. The special case of a third-order stationary autoregressive model is adopted as the basic or core model. (See W72-14638) (Bell-Cornell)
W72-14640

HYDRAULIC GEOMETRY AND LOW STREAMFLOW REGIMEN,
Illinois Univ., Urbana. Water Resources Center.
J. B. Stall, and C. T. Yang.
Available from the National Technical Information Service as PB-212 282, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 54, July 1972. 31 p, 18 fig, 8 tab, 27 ref. OWRR B-051-ILL (2).

Descriptors: *Channel flow, Dispersion, *Meanders, *Illinois, Energy, *Streamflow, *Low flow.
Identifiers: *Hydraulic geometry, Pools, Riffles, *Unit stream power, Kaskaskia River basin.

Unit stream power defined as the time rate of potential energy expenditure per unit weight of water of a natural stream has been studied intensively. The distribution and variation of unit stream power have a determinate effect on the behavior of a natural stream. The unit stream power can be regulated by a stream through the combined process of meandering, forming pools and riffles, and carving a concave longitudinal stream bed profile. A study of the Kaskaskia River basin shows that sinuosity increases in the downstream direction by meandering. Field measurements made along the Middle Fork Vermilion River indicate that unit stream power can be minimized by the formation of pools and riffles. The hydraulic geometry--unit stream power equations developed for 9 river basins in the United States show that unit stream power in a river basin decreases with increasing frequency of flow and drainage area. These results are evidence of different levels of self adjustment made by a natural stream to minimize its unit stream power in accordance with the law of least time rate of energy expenditure. The calculated dimensionless dispersion coefficients at 11 gaging stations in the Kaskaskia River Basin show that the coefficients increase with increasing width-depth ratio.
W72-14680

WATER BALANCE AND FLOW STUDY IN THE BRAHMAPUTRA-GANGES BASIN OF EAST PAKISTAN,
East Pakistan Water and Power Development Authority, Dacca.
M. R. Tarafdar.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 613-622, 2 fig, 4 tab, 5 ref.

Descriptors: *Water balance, *Floods, *Rivers, Water storage, Water yield, Runoff, Rainfall-runoff relationships, River basins, Watersheds (Basins), River forecasting.
Identifiers: *Brahmaputra-Ganges Basin (Pakistan).

The flood problem in East Pakistan is caused by the two mighty rivers, the Ganges and the Brahmaputra. To study this flood problem the Hydrology Directorate of EPWAPDA (East Pakistan Water and Power Development Authority) and FAO-UNDP undertook a joint venture into flood measurement and water balance. The pattern of flow of the two rivers, intensity of flooding in the area, overbank spill on both banks of the Brahmaputra, and their effects in this area were determined. The intensity of peak floods in the area is due to change of storage and every year more than 96% of the gain is contributed by streamflow. (Knapp-USGS)
W72-14720

SEPARATION OF HYDROGRAPH COMPONENTS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
M. Ludovit.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 634-639. 5 fig, 7 ref.

Descriptors: *Hydrograph analysis, *Water balance, *Rainfall-runoff relationships, Runoff, Infiltration, Base flow, Recession curves, Evapotranspiration, Percolation, Subsurface runoff, Peak discharge.

The determination of the terms of a balance equation requires a detailed analysis of the basic components of the water regime, one of which is runoff. Separation of runoff components may be on the basis of the runoff genesis or by taking into consideration the actual conditions in the watershed. The two methods are described and compared for single peak hydrography, multipeak hydrographs, and for mountain watersheds. (Knapp-USGS)
W72-14722

FLOODS OF AUGUST 1967 IN EAST-CENTRAL ALASKA, WITH A SECTION ON WEATHER FEATURES CONTRIBUTING TO THE FLOODS,
Geological Survey, Washington, D.C.
J. M. Childers, J. P. Meckel, G. S. Anderson, and S. L. Diemer.
Available from GPO, Washington, DC 20402, Price $1.25 (Paper cover). Geological Survey Water-Supply Paper 1880-A, 1972. 77 p, 36 fig, 2 plate, 7 tab, 11 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *Flood discharge, *Alaska, Flood frequency, Streamflow, Flood recurrence interval, Floodwater, Peak discharge, Precipitation (Atmospheric), Stream gages, Runoff.
Identifiers: *Alaska floods (August 1967), East-Central Alaska.

East-central Alaska had record floods near Fairbanks following extensive rains of August 8-20, 1967. Precipitation during this period totaled as much as 10 inches, which is close to the average annual precipitation for this area. The most extensive flooding occurred in the White Mountains northeast of Fairbanks and along the major streams draining those mountains. Some of the major streams flooded were the Salcha, Chena, Chatanika, Tolovana, and lower Tanana Rivers, and Birch Creek west of Circle. Peak discharges on some streams were from two to four times the probable 50-year flood. The peak discharge of 74,400 cubic feet per second of the Chena River at Fairbanks, from 1,980 square miles of drainage area, was 2.6 times the 50-year flood. The rise of ground-water levels in the Tanana River flood plain to the land surface during the flood caused foundation failures and prevented drainage of subsurface structures. Above-normal ground-water levels existed until the middle of September. Total flood damage was estimated in excess of $85 million. Six lives were reported lost, and about 12,000 persons were evacuated during the flood. (Woodard-USGS)
W72-14725

EVALUATION OF THE STREAMFLOW-DATA PROGRAM IN HAWAII,
Geological Survey, Honolulu, Hawaii.
G. Yamanaga.
Geological Survey Open-file Report, 1972. 28 p, 6 fig, 5 tab, 7 ref.

Descriptors: *Streamflow, *Rainfall-runoff relationships, *Hydrologic data, *Hawaii, Data collections, Evaluation, Project planning, Geology, Hydrogeology, Gaging stations, Stream gages, Aquifers, Reviews.
Identifiers: *Streamflow characteristics.

Streamflow data for Hawaii are evaluated and guidelines for planning future data programs are provided. At the end of the 1971 water year, there were 150 gaging stations in operation in Hawaii. The variability of streamflow in Hawaii reflects the extreme variability of rainfall. Mean annual rainfall in the Islands ranges from 6.5 inches in Kawaihae to about 460 inches at Mt. Waialeale. On each of the major islands, average rainfall ranges from less than 18 inches to more than 250 inches per year. Streamflow reflects differences in geology. Perennial streams are found where the terrain has become relatively impervious due to weathering and also below springs which act as drains for groundwater fed by percolation into pervious surfaces and confined by dikes or other geologic features. In areas of relatively fresh lava where there are no confining features, rain disappears into the ground and except during extremely heavy rains, channels are dry throughout their length. (Woodard-USGS)
W72-14737

A MOMENTUM APPROACH TO OPEN CHANNEL TRANSITIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14745

CONNECTICUT RIVER BASIN PLAN FOR COMPREHENSIVE DEVELOPMENT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 08A.
W72-14751

MEASUREMENT AND ANALYSIS OF NATURAL-TYPE SURFACE ROUGHNESSES AFFECTING FLUID FLOW,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 08B.
W72-14837

A RANDOM-WALK SIMULATION MODEL OF ALLUVIAL-FAN DEPOSITION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
E. S. Simpson, and W. E. Price, Jr.
Arizona Water Resources Research Center Partial Technical Completion Report, May 15, 1972. 4 p. OWRR A-020-ARIZ (6).

Descriptors: Alluvial fans, *Markov processes, *Sedimentation, *Model studies, Statistical methods, Forecasting, *Monte Carlo method.
Identifiers: *Digital models, *Random walk, *Stochastic model.

A digital model based on a random walk was used in an experiment to determine how well such a model is able to simulate alluvial-fan deposition. The model is in three dimensions and is dynamic with respect to both time and space. Two principal stochastic events were employed, (1) a relative uplift of the mountain area that is the source of the fan sediments, and (2) a storm event of sufficient magnitude to result in the deposition of material on the fan. These two events are assumed to follow independent Poisson processes with exponentially distributed interoccurrence times. The pattern of deposition is determined by a random walk from the canyon mouth at the mountain front, and each depositional event is assumed to occur instantaneously. The direction that each step in the walk takes is determined probabilistically by the gradient in the direction of flow, the momentum of flow, and the boundary conditions stipulated in the model. The type of flow, whether a depositing debris or water flow, or eroding water flow, depends upon the thickness of erodible material in the source basin. Deposition is assumed to occur over the entire route of flow either as a bed tapered in the direction of flow or as a bed of uniform thickness. The particle-size distribution of the water-flow deposits is governed by the slope in the direction of flow. Erosion is considered negative deposition and results from the exponential decline in elevation of the main stream channel at the fan apex during periods of no uplift, or from water flows containing little basin sediment. Results from the computer runs were printed as geologic maps of the fan surface, and geologic sections through the deposits; these indicate that, at least qualitatively, a random-walk model provides a reasonable basis for simulating alluvial-fan deposition. (See also W72-10270, W71-04269 and W71-11858).
W72-14915

INVESTIGATION OF TIME PARAMETER OF WATERSHEDS,
South Dakota State Univ., Brookings. Water Resources Inst.
For primary bibliographic entry see Field 02A.
W72-14918

AN IMPROVED TEMPERATURE PREDICTION MODEL FOR SMALL STREAMS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
G. W. Brown.
Available from the National Technical Information Service as PB-212 385, $3.00 in paper copy, $0.95 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report (1972). 20 p, 6 fig, 9 ref. OWRR A-007-ORE (1).

Descriptors: *Model studies, *Water temperature, *Streams, Energy budget, Solar radiation, Streambeds, Bedrock.

A model for predicting the maximum change in temperature for completely exposing a reach of stream to solar radiation was developed during earlier research. This model, which assumes that net solar radiation is the sole source of energy to the stream, worked well on most streams. In a few cases it worked very poorly. These streams contained either a large proportion of pools or bed rock in the stream bottom. Only the flowing portion of the pools should be included in the heat exchange process. The bed rock stream bottoms can conduct about 20% of the incident solar radiation away from the stream. Reducing the estimates of stream surface area and net heat load according to pool configuration and bed condition provided good estimates of temperature change using the original model.
W72-14920

STOCHASTIC SPACE-TIME MODELS OF THE RAINFALL-RUNOFF PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02A.
W72-14922

EFFECT OF CATCHMENT AREA ON FLOOD MAGNITUDE,
Australian Rivers and Water Supply Commission, Victoria, New South Wales.
For primary bibliographic entry see Field 02A.
W72-14946

A SEMI-AUTOMATIC GATE TO IMPROVE THE SENSITIVITY OF THE CRUMP WEIR AT LOW FLOWS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 08C.
W72-14947

FLOOD PEAKS AS MODIFIED BY DAM SIZE AND LOCATION,
State Univ. of New York, Syracuse. Coll. of Forestry.
P. E. Black.
Water Resources Bulletin, Vol 8, No 4, p 780-783, August 1972. 2 fig, 2 tab, 7 ref.

Descriptors: *Flood control, *Hydraulic models, *Simulated rainfall, *Dams, Rainfall-runoff relationships, Reservoirs, Watershed management, Peak discharge, Time lag, Time of concentration, Hydrographs, Recession curves, Reservoir design.

Storms were simulated on a rainfall simulator over a hydraulic model to study the effectiveness of dams of different sizes and locations in reducing flood peaks. When storms uniformly and completely cover the watershed, large dams are nearly twice as effective as a network of small and medium dams in reducing the flood. The lower portion of the watershed is the primary contributor to the peak when the watershed is completely and uniformly covered with rainfall. The dams had no discernible effect on lag time or on time of concentration. The model without dams exhibited a strongly curvilinear recession curve which was in contrast to the straightline recession curves with dams in place. The peak also is considerably flattened, from triangular form to a trapezoidal shape. (Knapp-USGS)
W72-14954

ROLE OF BASEFLOW IN RAINFALL-RUNOFF RELATIONS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02A.
W72-14955

MODIFICATIONS OF SHIELDED NET RADIOMETERS TO MEASURE SOLAR RADIATION PROFILES IN WATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 07B.
W72-14962

WATER RESOURCES APPLICATIONS OF STREAM CHANNEL CHARACTERISTICS ON SMALL FORESTED BASINS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 02A.
W72-14966

2F. Groundwater

SALTWATER INTRUSION EXTRACTION BARRIER,
California State Dept. of Water Resources, Los Angeles. Southern District.
J. J. Coe.
American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 98, No IR3, p 387-403, September 1972. 9 fig, 1 tab, 7 ref.

Descriptors: *Saline water intrusion, *Saline water barriers, *Groundwater barriers, *Withdrawal, *Cone of depression, Water pollution control, Saline water-freshwater interfaces, Groundwater movement, California.
Identifiers: *Oxnard (Calif).

An experimental extraction-type sea water intrusion barrier was tested near Oxnard in Ventura County, California, to develop information on halting intrusion in the area and in other areas with similar hydrologic and geologic conditions. Major facilities of the barrier were 5 extraction wells, 25 piezometers, one anode well for cathodic protection, and a discharge pipeline. During the barrier test, intrusion was halted in the test area and the intruded area decreased in size from 6,200 acres to 4,800 acres. However, because of inadequate extraction capacities at the pumping wells, it was not possible to lower the ground water levels at the extraction well line below the trough in the piezometric surface located inland of the test site. Difficulty was experienced with the cathodic protection system; use of noncorrosive materials is recommended. An extraction-type barrier is technically feasible to halt intrustion in the Oxnard area. (Knapp-USGS)
W72-14204

MOVING WATER TABLES IN TILE-DRAINED SOILS,
West Pakistan Univ. of Engineering and Technology, Lahore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W72-14218

SUBSURFACE HYDROGRAPH ANALYSIS BY CONVOLUTION,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
W. M. Snyder, and L. E. Asmussen.
American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 98, No IR3, p 405-418, September 1972. 7 fig, 3 tab, 9 ref.

Descriptors: *Hydrograph analysis, *Infiltration, *Subsurface runoff, *Mathematical models, *Rainfall-runoff relationships, Routing, Numerical analysis, Irrigation, Subsurface irrigation, Coastal plains, *Georgia.
Identifiers: Convolution integrals.

Subsurface flow from an 0.8-acre watershed in the Southern Coastal Plain at Tifton, Ga. is intercepted and gaged independently of any surface flows. The hydrographs of seven flow events following significant rainfall were analyzed by the nonlinear technique of two-stage convolution. The convolutional model is based on two conceptual components. A characteristic function represents the three-dimensional storage capability of the soil profile and thus could be visualized as a map of the flow potential of the drainage area. A state function expresses the movement, or routing, of the characteristic function to the outlet. This routing is

the first-stage convolution and produces a unit response function. Second-stage convolution of the response functions with effective rainfall produces the outflow hydrograph. The consistent results should allow identification of the parameters, and thus the two quasiphysical model components, with physical features of the drainage area. (Knapp-USGS)
W72-14219

GROUND-WATER OUTFLOW, SAN TIMOTEO--SMILEY HEIGHTS AREA, UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA, 1927 THROUGH 1968,
Geological Survey, Menlo Park, Calif.
L. C. Dutcher, and F. W. Fenzel.
Geological Survey Open-file Report, February 9, 1972. 30 p, 7 fig, 13 ref.

Descriptors: *Groundwater resources, *Groundwater movement, *Aquifer characteristics, *Discharge (Water), *California, Hydrogeology, Hydrologic data, Basic data collections, Test wells, Aquifer testing, Permeability, Pumping, Geology, Faults (Geologic).
Identifiers: *Santa Ana Valley (Calif).

Groundwater outflow in the San Timoteo-Smiley Heights area in the upper Santa Ana Valley, San Bernardino and Riverside Counties, Calif., was estimated by an indirect method not involving balancing of the hydrologic budget. To provide data for the outflow estimates, several miles of reflection and refraction seismic transverses were made along and across the outflow section. Nineteen deep and shallow test holes were drilled; one of the deep test holes and several existing wells were pumped to obtain data on aquifer permeability. The estimated average permeabilities of the aquifer materials range from 5 gpd per square foot for the lower part of the San Timoteo beds to 220 gpd per square foot for the upper part of the San Timoteo beds. The estimated outflow in 1927 was 8,150 acre-feet. By 1967 the estimated total outflow was 5,350 acre-feet, a reduction of approximately 34%. During the 12-year period 1956 through 1967, however, the annual outflow decline has been considerably less than the average for the 41-year period 1927 through 1967, and the decline as of 1968 was about 30-35 acre-feet per year. (Woodard-USGS)
W72-14233

DIGEST OF THE CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W72-14234

GROUND-WATER FLOW,
Geological Survey, Harrisburg, Pa.
C. R. Wood.
Photogrammetric Engineer, Vol 38, No 4, p 347-352, Apr 1972. 6 p, 5 fig, 1 illus.

Descriptors: *Base flow, *Springs, *Inflow, Aquifers, Seepage, Infrared detectors, Aerial photography, Discharge (Water), Thermal diffusion, Hydrology, Remote sensing, Water temperature, Seasonal, Soil temperature, Waste water, Color photography, *Pennsylvania.
Identifiers: *Groundwater flow, *Infra red photography, Thermal diffusion, *Lehigh River (Pa).

A cooperative USGS-NASA program conducted on the Lehigh River, Pa, developed remote-sensor technology in the solution of water resources problems. Four sets of infrared imagery were taken from low altitude flights and surface-water temperatures were measured at 25 sites during the flights. An infrared imager sensing in the 8-14 micrometer bandwidth was used. Failures and successes are described and causes given. Results showed: (1) No relation between size of dark areas on imagery and rate of ground-water discharge was discerned; (2) numerous springs and seeps on the riverbanks were detected but most inflow through the riverbed was not detected; (3) size of dark imagery area depends more on the depth and velocity of the river than on quantity of water discharged; (4) predawn winter imagery is probably most favorable; and (5) low river flows must prevail. (USBR)
W72-14248

GEOTHERMAL STEAM IN THE GEYSERS--CLEAR LAKE REGION, CALIFORNIA,
L. E. Garrison.
Geological Society of America Bulletin, Vol 83, No 5, p 1449-1468, May 1972. 15 fig, 3 tab, 30 ref.

Descriptors: *Geothermal studies, *California, *Steam, *Thermal power, Heat flow, Thermal water, *Geysers, Water vapor, Hydrogeology, Aquifer characteristics, Geophysics.

Dry, superheated natural steam from wells in the Mayacmas Mountains, north-central California Coast Ranges is used to generate electrical power. The source of the heat is a shallow intrusive magma body emplaced in Quaternary to Holocene time. Magmatic heat is transmitted through the largely impermeable country rock by conduction. Convectional heating takes place in zones of permeability and porosity caused by faulting and shearing. Most of the thermal fluid is derived from meteoric water, but some is probably derived from the magma. In the exploited part of the system the fluid is in the vapor state. This controls the temperature and pressure regime; reservoir pressures are lower than hydrostatic pressures in a liquid-dominated system. Generation capability was 182,000 kwh in 1971, and a capability of more than 600,000 kwh is projected for 1975. (Knapp-USGS)
W72-14351

RELATIONS OF FRESH AND SALTY GROUND WATER ALONG THE SOUTHEASTERN U.S. ATLANTIC COAST,
Geological Survey, Brunswick, Ga.
For primary bibliographic entry see Field 02L.
W72-14518

COMPOSITION OF FLUID INCLUSIONS,
Geological Survey, Washington, D.C. Geologic Div.
For primary bibliographic entry see Field 02K.
W72-14519

EFFECTS OF THE JANUARY AND FEBRUARY 1969 FLOODS ON GROUND WATER IN CENTRAL AND SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. L. Hughes, and A. O. Waananen.
Geological Survey Open-file Report, 52 p, 1972. 12 fig, 10 tab, 30 ref.

Descriptors: *Floods, *Flood data, *Groundwater recharge, *Hydrologic data, *California, Water levels, Water wells, Aquifers, Groundwater resources, Groundwater availability, Water supply, Water storage, Reservoirs, Water level fluctuations.
Identifiers: *Central California, *Southern California.

Precipitation in 1969 in some areas of central and southern California was as much as 150 percent of average, principally as a result of heavy rains in January and February. The winter storms caused recordbreaking floods in many areas. A 216-foot water-level rise was recorded in a well in the Lytle Creek area in San Bernardino County. Diversion of floodflows from stream channels to prepared spreading grounds contributed greatly to groundwater in storage and reduced the flows discharged directly to the ocean. Reservoir storage aided in groundwater recharge through retention of runoff for release after floodflows subsided. Recharge to groundwater storage from direct precipitation and percolation of storm runoff and floodflows in nine major drainage basins was estimated to be at least 2.4 million acre-feet. Flood damages in southern California in 1969 exceeded $210 million. In contrast, the water added to groundwater in storage is valued at more than $66 million, on the basis of the cost of an equivalent supply from other sources. (Woodard-USGS)
W72-14525

HYDROLOGIC RECONNAISSANCE OF THE PROMONTORY MOUNTAINS AREA, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14526

PROCEDURE AND RESULTS OF GROUNDWATER POLLUTION STUDIES IN TEHERAN AREA, IRAN,
Ministry of Water and Power, Teheran (Iran). Research Div.
For primary bibliographic entry see Field 05B.
W72-14590

ON HYDROGEOLOGY AND GROUNDWATER WELLS OF ETHIOPIA,
Ministry of Public Water Works, Addis Ababa, (Ethiopia). Water Resources Dept.
For primary bibliographic entry see Field 04B.
W72-14591

GROUNDWATER BASIN TYPES IN TURKEY,
State Hydraulic Works, Ankara (Turkey). Groundwater Div.
T. Y. Oldac.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 12-15, 1972. 5 fig, 18 ref.

Descriptors: *Groundwater basins, *Hydrogeology, *Aquifer characteristics, Aquifers, Alluvium, Limestones, Groundwater movement, Mapping, Lakes, Water balance.
Identifiers: *Turkey.

Data from more than 500 different basin investigations were used to classify groundwater basins in Turkey. Turkey has two ranges of older rocks, which are parallel to sea shores in the north and in the south. Generally, large faults trend east-west. Groundwater basin types in Turkey may be classified in five different groups depending on geological, morphological and hydrological characteristics. The types include neogene basins with alluvium, closed-semiclosed basins with lake sediments, valley alluvium basins, limestone basins overlain by impervious or semipervious layers, and delta and shoreline plain basins. (Knapp-USGS)
W72-14592

PALEOZOIC SANDSTONE AQUIFERS IN SAUDI ARABIA,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
G. Otkun.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971 Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 16-21, 1972. 4 fig, 5 tab, 7 ref.

Descriptors: *Water resources, *Hydrogeology, *Aquifers, *Water quality, *Water yield, Water resources development, Aquifer characteristics, Stratigraphy.
Identifiers: *Saudi Arabia.

Absence of surface water and scarcity and irregularity of rainfall make Saudi Arabia dependent upon groundwater and give the impression that this country is very poor in water. However, investigations carried out in recent years have proved that two types of formations in particular, sandstone and limestone-dolomite, are capable of producing considerable amounts of water, at least over two-thirds of the Kingdom. One-third of the country is covered by metamorphic and igneous rocks which yield little groundwater, yet the other two-thirds are occupied by sedimentary formations which generally form very good reservoirs. The quantity of water which can be mined from the storage is considerable and can be expressed in hundreds of millions of cubic meters per year. If properly exploited, the Paleozoic Sandstone Aquifer will have a major part in the development of Saudi Arabia. (Knapp-USGS)
W72-14593

THE HYDROGEOLOGY OF THE ANSEONG RIVER BASIN, KOREA,
Geological Survey of Korea, Seoul.
J. U. Lim.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971. Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 41-44, 1972. 2 fig, 1 tab.

Descriptors: *Hydrogeology, *Mapping, Water balance, Aquifer characteristics, Alluvium, Alluvial channels, Water yield, Transmissivity, Water resources development.
Identifiers: *Anseong River basin (Korea).

A hydrogeological map of the Anseong River basin, Korea, was completed in 1969. The main purpose of the study was to find the hydrogeological conditions as a basin unit instead of on a small scale. The geology of the basin consists of impermeable gneiss, schist and granite. The principal aquifer is alluvium, in part lacustrine deposits of silt and silty sand, and valley deposits of sand, gravel, and detrital materials. The direction of groundwater movement is almost parallel to the river channel. The coefficient of transmissibility in the most favorable conditions ranges from 0.8 to 3.0 square meters per minute but rapidly decreases in the outer part of the same area. The annual mean precipitation in this area amounts to 1,130 mm, and possible total yield of water is at least 630,000 cubic meters per day. (Knapp-USGS)
W72-14594

GROUNDWATER RECHARGE BY DAMMED UP RIVERS,
For primary bibliographic entry see Field 04B.
W72-14595

ARTIFICIAL RECHARGE IN JAPAN,
Geological Survey of Japan, Kawasaki.
For primary bibliographic entry see Field 04B.
W72-14596

ESTIMATING THE TRANSMISSIVITY OF AQUIFERS FROM THE FORMATION CONDUCTANCE,
Ministry of Water and Power, Tehran (Iran). Div. of Groundwater.
For primary bibliographic entry see Field 04B.
W72-14597

PRELIMINARY NOTE ON THE FORMULATION OF MATHEMATICAL MODELS FOR THE STUDY OF NON-LINEAR FLOWS IN AQUIFERS,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
M. Benedini, G. Cicioni, and G. Giuliano.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 121-123, 1972. 10 ref.

Descriptors: *Mathematical models, *Groundwater movement, *Aquifer characteristics, *Turbulent flow, Darcys law, Porous media, Dupuit-Forchheimer theory, Permeability, Transmissivity.

Non-Darcy flows are frequently observed in water-bearing materials; their study can be useful in groundwater exploitation. Mathematical models of water flow in aquifers may be generalized in such a way as to allow for consideration of both linear and nonlinear flows. Such a model is presented with applications to some well-known nonlinear laws in steady and unsteady flow conditions. Special attention is given to the formulation of initial conditions, the form of which is affected by the nonlinearity of the flow law. These difficulties along with the boundary conditions substantially affect the nature of approach to the final solution. (Knapp-USGS)
W72-14598

HYDROLOGICAL STUDIES OF EVAPOTRANSPIRATION AND GROUNDWATER FLOW IN SANDY LAND,
For primary bibliographic entry see Field 02D.
W72-14599

PROSPECTING OF UNDERGROUND WATER BY THE MEASUREMENT OF NATURAL RADIOACTIVITY,
National Research Institute of Agricultural Engineering, Hiratsuka (Japan).
T. Ochiai.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 159-163, 1972. 4 fig, 5 ref.

Descriptors: *Exploration, *Groundwater, *Gamma rays, *Spectrometers, *Instrumentation, Hydrogeology, Water chemistry, Radioactivity techniques, Nuclear moisture meters.
Identifiers: *Japan.

Groundwater may be detected by means of natural radioactivity. Seven kinds of measuring instruments have been tested. In 1956, a car-borne continuous-measuring instrument was developed. Three scintillation counters are set outside the car, and the compound value of the measurements of the counters is recorded. The detector consists of a ground surface scintillation counter, a detector of cosmic rays, a 5-channel gamma-ray pulse height analyzer, and a recorder. The gamma-ray energy is separated into five channels through the linear amplifiers and self-recorded by a five-pen recorder. (Knapp-USGS)
W72-14600

DETERMINATION OF THE RELATION BETWEEN GROUNDWATER LEVEL, PRECIPITATION AND OVERDRAFT,
Aegean Univ., Bornova (Turkey).
U. Ozis, E. Karabacak, and E. Benzeden.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 178-180, 1972. 3 fig, 4 ref.

Descriptors: *Water balance, *Safe yield, *Correlation analysis, *Stochastic processes, *Saline water intrusion, Water levels, Withdrawal, Recharge, Water yield, Precipitation (Atmospheric), Statistical methods.
Identifiers: *Bornova Plain (Turkey).

The relation between groundwater level and precipitation over the recharge area may be analysed by methods of stochastic hydrology in order to confirm the existence of an overdraft and to compute the extent of this overdraft. The method was applied to Bornova plain in Turkey. Although the available data were quite limited and the serial correlation in the nature of groundwater level sets as well as cumulative precipitation sets was not good, the regression equations of groundwater level on cumulative precipitation proved to be significant. Through the use of these equations, the overdraft rate was computed as 2.5 m/year, whereas the average safe draft is expected to be 2.0 m/year. This large excess draft may cause the intrusion of saline seawater, unless counteractive measures are taken. (Knapp-USGS)
W72-14601

DETERMINATION OF THE RELATION BETWEEN SPRING DISCHARGE AND PRECIPITATION--AN APPLICATION TO SARIKIZ SPRINGS IN TURKEY,
Aegean Univ., Bornova (Turkey).
For primary bibliographic entry see Field 02A.
W72-14602

GRAPHICAL METHOD FOR ESTIMATING THE TRANSMISSIBILITY AND STORATIVITY OF AQUIFERS FROM SPECIFIC CAPACITY OF WELLS,
Egyptian Desert Inst., Cairo.
S. Rashwan.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 185-188, 1972. 4 fig, 2 tab, 4 ref.

Descriptors: *Aquifer testing, *Storage coefficient, *Drawdown, *Transmissivity, *Specific capacity, Water yield, Water wells, Aquifer characteristics, Artesian aquifers.

The specific capacity of a well can be used as a useful method for estimating the hydrologic parameter of the aquifer. The specific capacity of the well, which is the discharge per unit drawdown, decreases with time. If the discharge during the pumping test is constant, then the specific capacity should vary with time. Transmissibility and storativity of the aquifer are two main factors for shaping the slope of the time-specific capcity curve. Values of specific capacity and corresponding time are plotted on log- log paper with time in minutes as X axis and specific capacity values as Y axis. A straight line will be obtained. This graphical method is rapid and easy for wells of 8 or 9 inches diameter without serious errors. (Knapp-USGS)
W72-14603

APPLICATION OF THE WATER BALANCE SIMULATION FOR PREDICTING LAND SUBSIDENCE--A DIGITAL COMPUTER APPROACH,
T. Shibasaki, A. Kamata, and M. Wada.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 197-202, 1972. 6 fig, 11 ref.

Descriptors: *Water balance, *Artesian aquifers, *Land subsidence, *Simulation analysis, Mathematical models, Numerical analysis, Finite element analysis, Seepage, Groundwater movement, Withdrawal, Recharge.
Identifiers: *Niigata (Japan).

Nonsteady-state ground water flow in leaky aquifer systems can be approximated by difference-differential equations. A digital computer simulation program was written to solve the equation using a finite-difference technique. The simulation technique was used in the study of land subsidence problems in the Niigata lowland area of Japan. The computed squeeze rate from semi-pervious strata into the main aquifer almost agrees with the measured land subsidence rate. The recharge rate to the confined ground water basin varies with the hydraulic head loss caused by pumping discharge from the main aquifer system. The induced supplemental recharge can be divided into the lateral seepage flow through the aquifer and the vertical inflow into the main aquifer from confining strata. The vertical recharge is estimated to be about 60 to 70% of the total recharge to the main aquifer. (Knapp-USGS)
W72-14604

A STUDY ON THE MECHANISM OF CONFINED GROUNDWATER RECHARGE,
Tokyo Univ. (Japan). Faculty of Engineering.
S. Shindo.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 203-207, 1972. 5 fig.

Descriptors: *Artesian aquifers, *Confined water, *Land subsidence, *Hydraulic models, *Recharge, Water yield, Withdrawal, Model studies, Water balance.
Identifiers: *Kanto Basin (Japan).

In most confined aquifers, groundwater recharge varies with the discharge to some extent. The greatest part of recharge is supplied by leakage and by squeezing of aquitards. Experimental studies are described on the recharge mechanism and results are applied to the groundwater conditions of the Kanto basin of Japan. A tank model was used with a stratified columnar section. The permeability of the clay aquitard was 0.00005 cm/sec and that of the gravel aquifer was 0.28 cm/sec. In this region the discharge has exceeded the recharge over a long period of time. Accordingly, most of the discharge nowadays is not circulating groundwater but stored groundwater. (Knapp-USGS)
W72-14605

WATER QUALITY PROBLEM IN EASTERN OSAKA, JAPAN,
Osaka City Univ. (Japan).
M. Tsurumaki.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 208-214, 1972. 4 fig, 2 tab, 8 ref.

Descriptors: *Water quality, *Chlorides, *Connate water, *Water circulation, *Water chemistry, Tracers, Tritium, Land subsidence, Withdrawal, Hydrogeology.
Identifiers: *Osaka (Japan).

In eastern Osaka, Japan, four main types of water based on alkalinity and chloride content are described, with subdivision based on tritium content. The waters characterized by high chloride (100 to 300 ppm) are distributed in the central part of this area. The chloride ion was derived from ancient saline water entrapped in the sediments deposited in a marine or brackish environment. As a result of this study three discontinuous lines of water-quality were found. Although one of them coincides with a geological structure and the others lack geological evidence, the pattern of these discontinuities provides a reasonable interpretation for the groundwater movement as well as for the distribution of the amount of land subsidence in this area. (Knapp-USGS)
W72-14606

A STUDY OF THE RELATIONSHIP BETWEEN THE GEOPHYSICAL P.D.R. (POTENTIAL DROP RATIO) RESISTIVITY MEASUREMENTS AND THE COEFFICIENT OF TRANSMISSIBILITY (T) OF THE AQUIFERS,
State Hydraulic Works, Ankara (Turkey). Groundwater Div.
M. Yaralioglu, and M. Boybeyi.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 215-221, 1972. 14 fig, 6 ref.

Descriptors: *Electrical studies, *Geophysics, *Resistivity, Surveys, Exploration, Water resources development, Geohydrologic units, *Transmissivity.
Identifiers: *Turkey, *Potential drop ratio.

Potential drop ratio resistivity surveys are more effective than surface resistivity surveys (vertical electrical sounding) in defining the boundaries of horizontal water bearing layers. It is possible to define by this method the anomalies of zones under investigation as a function of depth, when there is a significant resistivity contrast between the layers. The method was applied in the eastern part of Middle Anatolia and north of Eregli-Bor closed Basin, Turkey. The transmissibility values of aquifers in the area vary between 88 and 9100 cu m/day/m. (Knapp-USGS)
W72-14607

DISPERSION OF GROUNDWATER FLOW,
National Research Center for Disaster Prevention, Tokyo (Japan).
K. Yuhara.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 224-230, 1972. 7 fig, 3 tab, 6 ref.

Descriptors: *Dispersion, *Porous media, *Groundwater movement, Mixing, Flow, Hydraulics, Path of pollutants, Darcys law, Diffusion.

Flow of fluid through porous material is microscopically very complex and each fluid particle moves through small complex channels which have different directions from the mean flow direction and have many joints or branches. Therefore, the microscopic stream lines of the flow may, even if in the laminar flow region, be twined three-dimensionally at the joints or branches. In study of dispersion in flow through porous material, the mean length between two twining points is called the mean twining length, and it is compared to the mean mixing length of the turbulent motion. The dispersion is proportional to the mean filter velocity of the flow, the diameter of the sand particle, and a function of the porosity. Some experiments show such proportionality, and show the mean twining length to be about 0.09 cm for the porous medium used. (Knapp-USGS)
W72-14608

A REVIEW OF THE STOCHASTIC APPROACH TO FLOW THROUGH POROUS MEDIA,
Illinois Univ., Urbana.
L. Torelli, and A. E. Scheidegger.
Paper presented at International Symposium on Stochastic Hydraulics, Pittsburgh, May 31-June 2, 1971. 13 p, 4 fig, 16 ref. OWRR C-1613 (3146) (2).

Descriptors: *Flow characteristics, *Porous media, *Model studies, *Reviews, *Stochastic processes, Groundwater movement, Hydrogeology, Water pollution, Path of pollutants, Analytical techniques, Capillary conductivity, Transmissivity, Hydraulics.
Identifiers: *Random geometry models.

Some random geometry models of flow through porous media are reviewed. Three groups of models are distinguished: In the first group, the randomness is described as inherent in the fluid particle; in the second group, the randomness is ascribed to the medium. In the first case one has random walk models, in the second some kind of modified random maze model. The third group consists of topological models in which statistics is done over ensembles of bifurcating graphs which are considered to represent the path followed by a fluid particle which undergoes successive splittings. In addition, some probabilistic descriptions of the geometry of porous media are reviewed, which do not treat the problem of flow through porous media directly. (Woodard-USGS)
W72-14610

DISTINGUISHING SEASONAL RECHARGE TO GROUNDWATER BY DEUTERIUM ANALYSIS IN SOUTHERN ARIZONA,
Arizona Univ., Tucson.
E. S. Simpson, D. B. Thorud, and I. Friedman.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 623-633. 1 fig, 4 tab, 15 ref.

Descriptors: *Water balance, *Groundwater basins, *Arizona, Deuterium, Stable isotopes, Tracers, Recharge, Water sources, Runoff, Snowmelt, Hydrogeology, Alluvium, Streamflow, Precipitation (Atmospheric).
Identifiers: *Tucson Basin (Ariz).

The Tucson Groundwater Basin in southern Arizona covers an area in excess of 600 square miles and contains sediment more than 1,000 feet thick. The apparent age of groundwater (determined by C-14 analyses) ranges from zero (near recharge areas) to about 6,000 years. Average annual precipitation is about 11 inches; slightly more than half occurs during the summer as convective storms and most of the remainder during the winter as frontal storms. Summer moisture mostly originates in the Gulf of Mexico and winter moisture mostly comes from the Pacific Ocean. All streams in the basin are intermittent. Seventeen summer storms in 1968 show a weighted average deuterium value of -4.2 percent (relative to SMOW) and 14 winter storms in 1968-69 show a weighted average value of -6.1 percent. Two groundwater samples from wells near a recharge area show -6.6 and-6.3 percent values. Two other wells in widely separated parts of the valley, tapping much older water, show values of -5.8 percent each. The deuterium values for most snowfall and snowmelt in the surrounding mountains range from about -6 to -11 percent. The greater isotopic similarity between winter precipitation and groundwater suggests that winter runoff is the dominant factor in producing recharge. (Knapp-USGS)
W72-14721

GROUND-WATER RESOURCES OF ORANGE AND ULSTER COUNTIES, NEW YORK,
Geological Survey, Washington, D.C.
M. H. Frimpter.
Available from GPO, Washington, DC 20402, Price $1.25 (Paper copy). Geological Survey Water-Supply Paper 1985, 1972. 80 p, 34 fig, 4 plate, 4 tab, 42 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Water yield, *New York, Water wells, Water levels, Water level fluctuations, Chemical analysis, Groundwater movement, Water utilization.
Identifiers: *Orange County (NY), *Ulster County (NY).

The ground-water resources of Orange and Ulster Counties, in southeastern New York, occur in Pleistocene sand and gravel deposits of glacial origin and in Precambrian and Paleozoic consolidated rocks. The aquifer in the valleys of the Neversink River and Basher Kill between Port Jervis and Summitville, with an estimated groundwater yield of about 100 mgd (millions gallons per day) could be the most productive aquifer in southeastern New York exclusive of Long Island. An additional 20 mgd might be produced from similar deposits between Phillipsport and Wawarsing. Numerous smaller sand and gravel aquifers are scattered throughout the valleys of the two counties. Major parts of the two larger stream valleys, the Wallkill River and Esopus Creek valleys, are filled with relatively impermeable clay and silt. The consolidated rock has secondary porosity and is a dependable aquifer for small domestic supplies, but not for municipal and industrial supplies. Notable exceptions are the brecciated fault zones in southeastern Orange County and the carbonate rocks deep in the Rondout Creek and Sandburg Creek valleys. Iron, manganese, and hydrogen sulfide are the most common and troublesome chemical pollutants of the groundwater in Orange and Ulster Counties but the water is generally of good chemical quality for public water supplies. (Woodard-USGS)
W72-14726

GROUND WATER IN CENTRAL ST. CROIX, U.S. VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 04B.
W72-14731

HYSTERESIS OF FLUX-GRADIENT RELATIONS FOR SATURATED FLOW OF WATER THROUGH CLAY MATERIALS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
For primary bibliographic entry see Field 02G.
W72-14736

GROUND-WATER CONDITIONS IN THE EAST SHORE AREA, BOX ELDER, DAVIS, AND WEBER COUNTIES, UTAH-1960-69,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14742

WATER RESOURCES OF THE CROW WING RIVER WATERSHED, CENTRAL MINNESOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14743

'SLATON CHANNEL' -- A BURIED VALLEY,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04B.
W72-14877

BIBLIOGRAPHY OF GROUND-WATER STUDIES IN NEW MEXICO.
New Mexico State Engineer, Santa Fe.

New Mexico State Engineer Special Publication, March 1972. 28 p, 1 fig.

Descriptors: *Bibliographies, *Publications, *Groundwater resources, *New Mexico, Reviews, Documentation, Water wells, Aquifers, Water yield, Withdrawal, Water quality, Water utilization, Water demand, Groundwater recharge.

This bibliography includes 274 reports concerning groundwater resources in New Mexico. The bibliographic listing is in alphabetical order by the author's name, or by the publishing agency if no author is given. Each citation has been assigned a designation letter according to the increasing intensity and detailed nature of the study: a, reconnaissance; b, qualitative; and c, quantitative. The letter p has been added to designate in-progress studies. A map of New Mexico is keyed to locations of groundwater publications and studies. (Woodard-USGS)
W72-14938

STABLE ISOTOPE SURVEY OF THE FRESH WATER OCCURRENCES IN ISRAEL AND THE NORTHERN JORDAN RIFT VALLEY,
Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept.
For primary bibliographic entry see Field 02K.
W72-14945

RECHARGE, STORAGE AND DISCHARGE OF GROUNDWATER IN SOME SANDSTONE AREAS IN CENTRAL EUROPE,
Kiel Univ. (West Germany). Geological Inst.
G. Einsele.
Journal of Hydrology, Vol 16, No 3, p 247-259, July 1972. 8 fig, 1 tab, 12 ref.

Descriptors: *Water balance, *Groundwater, *Water storage, *Sandstones, Recharge, Discharge (Water), Water levels, Water table, Europe, Hydrogeology, Evapotranspiration, Aquifer characteristics.

Recharge curves in relation to precipitation and altitude (temperature) in central Europe may be derived from evapotranspiration data and compared with the results of other methods to determine groundwater replenishment in areas of strongly and moderately cemented sandstones as well as of loose sands. Infiltration and percolation of groundwater from a sandy cover into jointed sandstones, discharge of groundwater into streams, rapidly fluctuating discharge of contact springs, and constant base flow into effluent watercourses were demonstrated by a simplified model using average permeabilities. Under natural conditions the maximum difference between positive and negative annual storage is the amount of groundwater discharged in 2-2.5 years in moderately cemented sandstone areas. The corresponding change of piezometric surface amounts to about 10 m. (Knapp-USGS)
W72-14948

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA, PART III, INFLUENCE OF BOUNDARY CONDITIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. A. Wooding.
Journal of Hydrology, Vol 16, No 3, p 241-245, July 1972. 1 fig, 5 ref.

Descriptors: *Porous media, *Mass transfer, *Diffusion, *Chemical reactions, *Ion transport, Dispersion, Water chemistry, Permeameters, Chromatography, Solutes, Aqueous solutions.

The properties of solute transport involving first-order irreversible reaction in a finite column of porous material with unstirred fluid both upstream and downstream are described in a linearized system. If the effective diffusivity in the column is large compared with that in the unstirred fluid, the Danckwerts boundary conditions are appropriate. This situation is typically found in laboratory columns and chemical reactors. At the upstream boundary a pseudo-discontinuity in concentration exists, and depends upon the reaction rate and the rate of fluctuation of the input concentration. (The influence of downstream boundary conditions is exponentially small, and is neglected). At the downstream boundary, a small 'back-diffusion' zone exists, and serves to adjust the outlet concentration gradient to zero. (Knapp-USGS)
W72-14949

KARST SPRINGS IN THE VALE OF KASHMIR,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
J. M. H. Coward, A. C. Waltham, and R. J. Bowser.
Journal of Hydrology, Vol 16, No 3, p 213-223, July 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Springs, *Karst hydrology, *Hydrogeology, Tracers, Water sources, Water circulation, Dye releases, Aquifer characteristics, Limestones, Water chemistry.
Identifiers: *Vale of Kashmir (India).

The Vale of Kashmir is a basin surrounded by Triassic limestone mountains rising to over 4000 m. At the eastern end of the Vale a group of five large karst springs has a combined mean annual discharge of 9 cu m/sec. Two of the springs are supplied by their immediate limestone hinterlands. Leakage from clastic rocks into the limestone mass partially supplies two other springs. A dye test was carried out to confirm the hydrologic connection between the fifth spring and sinks along the bank of the Bringi River, 14 km from this spring. There was no structural or lithologic control for the spring positions, which were at the lowest hydrologic points of the limestone blocks. (Knapp-USGS)
W72-14950

2G. Water in Soils

MOVING WATER TABLES IN TILE-DRAINED SOILS,
West Pakistan Univ. of Engineering and Technology, Lahore. Dept. of Civil Engineering.
N. M. Awan, and T. O'Donnell.
American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 98, No IR3, p 459-477, September 1972. 9 fig, 17 ref.

Descriptors: *Water level fluctuations, *Hydraulic models, *Water table, *Tile drainage, Model studies, Drawdown, Steady flow, Subsurface drainage, Tile drains, Groundwater movement.
Identifiers: *Hele-Shaw models.

A Hele-Shaw analogy of the tile drainage problem was used to provide data on moving water table characteristics. The experimental data for water table recession following complete cessation of recharge are presented in comparison with five analytical solutions and two numerical solutions. Experimental data on rising water tables following sudden commencement of recharge are also presented. The drainage variables whose effects on the moving water table are reported are: (1) The initial or final steady-state mid-drain water table height; (2) the depth of the impermeable bed below the drain axis; and (3) the drain size. Drainage characteristics are virtually independent of the depth of the impermeable bed below the drain axis once that depth is one-eighth or more of the spacing between drains, regardless of the initial steady-state water table height. For given values of an appropriate dimensionless time parameter, the proportional amount of rise increases with increasing ym/d, but at a progressively diminishing rate. (Knapp-USGS)
W72-14218

STUDY OF PH AND EH CHANGES OF WATER-LOGGED SOIL AND IN PURE SYSTEMS,
National Commission on Agriculture, New Delhi (India).
S. K. Mukherjee, and S. N. Basu.
J Indian Soc Soil Sci. 19 (2): 197-202. Illus. 1971.
Identifiers: Hydroquinone, Potential, Redox, Soils, *Waterlogged soils, *Hydrogen ion concentration, *Eh values.

With the addition of hydroquinone in the pure systems of ferric ammonium sulfate and ferric phosphate, both the pH and Eh values decline. Under waterlogged conditions, soil pH, after slight initial depression, increases gradually to near neutrality while Eh values decrease gradually. Irrespective of days of submergence, Eh and pH values of submerged soil are lower with increasing soil depth. Water extractable P and ferrous Fe increase up to 20 days of submergence but decrease thereafter. Ferric Fe declines sharply at the end of 10 days followed by a gradual decrease.--Copyright 1972, Biological Abstracts, Inc.
W72-14269

LYSIMETER STUDIES ON THE SHORT TERM EFFECT OF COMPOSITION OF IRRIGATION WATER ON THE BORON ACCUMULATION IN SOIL,
Udaipur Univ. (India). Coll. of Agriculture.
For primary bibliographic entry see Field 05B.
W72-14283

MECHANISM OF THE FORMATION OF EXCHANGEABLE AMMONIUM NITROGEN IMMEDIATELY AFTER WATERLOGGING OF RICE SOILS,
Palli Siksha Sadana, Sriniketan (India).
A. K. Bhattacharyya.
J Indian Soc Soil Sci. 19 (2): 209-213. Illus. 1971.
Identifiers: *Ammonium nitrogen, Clay, Crystals, Lattice, Minerals, *Rice-M, *Soils, *Waterlogging.

When several rice soils (West Bengal) were waterlogged for 10 days, a marked increase of exchangeable NH4-N in many soils occurred; the fixed NH4-N, however, decreased. This strongly suggests that in waterlogging there was an expansion of crystal lattices of clay minerals (depending on the nature of mineralogical composition) when a part of the fixed NH4-N came out and were held as an exchangeable complex outside the crystal lattice. The increase of exchangeable NH4-N was not due to microbial activities.--Copyright 1972, Biological Abstracts, Inc.
W72-14287

TECHNIQUE FOR MEASURING C-1402 UPTAKE BY SOIL MICROORGANISMS IN SITU,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 05A.
W72-14301

A STUDY OF THERMOPHILIC AEROBIC SPOREFORMING BACTERIA ISOLATED FROM SOIL AND WATER,
Missouri Univ., Columbia. Dept. of Food Science and Nutrition.
For primary bibliographic entry see Field 05C.
W72-14324

AVAILABILITY OF SOIL MOISTURE (BESCHIKBAARHEID VAN WATER IN DE GROND),
Institute for Land and Water Management Research, Wageningen (Netherlands).
G. G. M. van der Valk, and W. P. Stakman.
Tuinbouwmededelingen Vol 32, No 123, p 421-426, October-November 1969. 5 fig, 1 tab, 1 ref.

Descriptors: *Soil-water-plant relationships, *Soil properties, *Moisture tension, Foreign research, Analytical techniques, Water table, Groundwater, Root zone, Soil water, Capillary water, Measurement, Curves, Soil types.
Identifiers: *Wageningen (Holland).

The availability of water and air for plants in a particular soil is described by means of moisture tension. Besides the available water in the root zone, additional water can be supplied from the zone below the roots and from the groundwater. This supply depends on the actual suction gradient, the depth of root zone and the depth of the groundwater table. An example is given of the calculation of the maximum possible capillary rise at certain rooting depths and a known groundwater depth. Clay soil has less favorable characteristics than sand or peat soil. (Woodard-USGS)
W72-14528

SOIL SURVEY OF TUCSON-AVRA VALLEY AREA, ARIZONA,
Soil Conservation Service, Tucson, Ariz.
F. W. Gelderman, B. A. Whitney, and W. P. Tripp.
April 1972. 70 p, 32 maps, 9 fig, 6 tab, 15 ref.

Descriptors: *Soil surveys, *Soil classification, *Arizona, *Arid climates, *Soil management, Mapping, Soil types, Land use, Soil engineering, Clay loam, Loam, Silts, Gravels, Sands.
Identifiers: *Tucson-Avra Valley (Ariz).

This soil survey is designed to be used in the management of farms and ranches in the area; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for agriculture, industry, and recreation. Detailed mapping, much of which was prepared from aerial photographs, is accessed from indexes. The survey includes descriptions of 31 different soils: their use and management both for irrigated and dryland soils; their formation and classification; and a section of general information on the physiography and climate of the area. A table showing engineering interpretations of the soils includes detailed information on all 31 soils covered, such as: (1) suitability as a source of topsoil, sand, gravel, or road fill; (2) soil features affecting highway location and uncompacted dikes, farm ponds, compacted embankments, irrigation, and trafficability; and (3) limitations for sewage disposal fields, and foundations for low buildings. (Paylore-Arizona)
W72-14576

GENERAL SOIL MAP LOWER PANTANO WASH AREA, PIMA COUNTY, ARIZONA - A SPECIAL REPORT WITH SELECTED ENGINEERING INTERPRETATIONS,
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 07C.
W72-14578

PRELIMINARY STUDY OF MERCURY RESIDUES IN SOILS WHERE MERCURY SEED TREATMENTS HAVE BEEN USED,
Agricultural Research Service. Hyattsville, Md.
For primary bibliographic entry see Field 05B.
W72-14623

HYSTERESIS OF FLUX-GRADIENT RELATIONS FOR SATURATED FLOW OF WATER THROUGH CLAY MATERIALS,
Slovenska Akademie Ved, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
V. Novak.
Journal of Soil Science, Vol 23, No 2, p 248-253, June 1972. 4 fig, 1 tab, 6 ref.

Descriptors: *Saturated flow, *Clays, *Porous media, *Hysteresis, *Expansion clays, Kaolinite, Bentonite, Hydraulic gradient, Darcys law, Groundwater movement, Soil water movement, Porosity, Pores, Laboratory tests, Permeameters, Permeability, Hydraulic conductivity.

The relation between flow velocity (V) and hydraulic gradient (I) was studied for two porous materials. The volume of the sample was allowed to change during experiment. For the kaolinite, the relation between v and I is non-linear, and the hydraulic conductivity k becomes dependent on time and varies for both increasing and decreasing I. After some time, k tends to some constant value. For bentonite, k remains constant as I increases. However, when I starts to decrease, k decreases accordingly. Hysteresis in the relationship between v and I remains unchanged with time. The observed deviations from Darcy's law may be due to deformation of the voids. (Knapp-USGS)
W72-14736

FIELD INVESTIGATION OF SELECTED FOUNDATION PIEZOMETERS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08G.
W72-14738

DETERMINATION OF SOIL MOISTURE CONTENT WITH AIRBORNE MICROWAVE RADIOMETRY,
Aerojet-General Corp., El Monte, Calif. Microwave Div.
G. A. Poe, and A. T. Edgerton.
Available from NTIS, Springfield, Va. 22151 as COM-72-10430 - Price $3.00 paper copy; $0.95 cents microfiche. Summary Report 4006R-2, September 1971. 43 p, 19 fig, 18 tab, 14 ref. NOAA 1-35378.

Descriptors: *Soil moisture, *Moisture content, *Remote sensing, *Microwaves, Radiation, Analytical techniques, Aircraft, Instrumentation, Measurement, Agriculture, Soils, *Arizona.
Identifiers: Brightness temperatures, *Phoenix Valley (Calif).

Airborne microwave brightness temperature measurements of agricultural soils in the Phoenix Valley, Arizona, on February 25 and March 1, 1971 were compared with extensive soil moisture measurements. Aircraft data were acquired by NASA/Goddard Space Flight Center, Greenbelt, Maryland. A comparison of results from available theory and measured data at 1.42, 4.99, 19.35, 37 and 94 GHz (frequency) is presented. Computation of correlation coefficients for measured brightness temperatures and measured soil moisture contents are also given. These comparisons reveal that the 1.42 and 4.99 GHz measured brightness temperatures consistently responded to measured soil moisture changes along the flight lines. Several reasons were advanced to explain the lack of correlation at the higher frequencies. (Woodard-USGS)
W72-14748

WASTE WATER RENOVATION IN CONNECTICUT SOILS,
Connecticut Agricultural Experimental Station, New Haven.
For primary bibliographic entry see Field 05D.
W72-14863

PLANT INDICATORS IN IRAQ. PART I - NATIVE VEGETATION AS INDICATOR FOR SOIL SALINITY AND WATERLOGGING,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
I. M. Habib, T. A. Al-Ani, M. M. Al-Mufti, B. H. Al-Tawil, and B. A. Takessian.
Iraq Ministry of Higher Education, Council for Scientific Research, Technical Report No 14, 1970. 15 p, 2 tab, 1 fig, 10 ref.

Descriptors: *Arid lands, *Halophytes, *Soil texture, *Salinity, *Soil analysis, *Desert plants, *Soil properties, *Soil-water-plant relationships, *Bioindicators, Land reclamation, Ecology, Habitats, Microenvironment, Saline soils, Salt tolerance, Soil types, Indicators, Saturation.
Identifiers: Iraq.

The main problems confronting cultivation in the Lower Mesopotamian Plain of Iraq are salinity and waterlogging of the soil. Degree of soil salinity can usually be estimated on the basis of plant cover. Combining correlations of native vegetation with soil salinity, waterlogging and soil texture was the purpose of this study which may prove to be a helpful tool in recognizing soil conditions with minimum time, effort and expenses. Each of the common native halophytes was found to grow in soils with a definite range of total soluble salts. A ranking of the various species for soil salinity and groundwater mineralization is given. Non-halophytic communities were mostly found in the northern part of Iraq, as expected. All halophytes were found in soils with groundwater depth ranging from 0.6-2.0 meters, except for Salsola vermiculata which could be used as an indicator for groundwater depth of more than 2 meters. Plant indicators for soil texture and recommendations for the possibility of reclaiming halophyte-inhabited soils are discussed. (See also W72-14869) (Black-Arizona)
W72-14868

PLANT INDICATORS IN IRAQ, PART II - MINERAL COMPOSITION OF NATIVE PLANTS IN RELATION TO SOILS AND SELECTIVE ABSORPTION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
T. A. Al-Ani, I. M. Habib, A. I. Abdulaziz, and N. A. Ouda.
Iraq Ministry of Higher Education, Council for Scientific Research Technical Report No 15, 1970, 12 p, 4 tab, 11 ref.

Descriptors: *Halophytes, *Saline soils, *Salinity, *Bioindicators, *Ecology, *Soil-water-plant relationships, *Salt tolerance, Terrestrial habitats, Absorption, Soil analysis, Desert plants, Resistance, Soil shemical properties, Soil types, Analytical techniques, Indicators.
Identifiers: Iraq.

Physiologically, halophytes may be divided into two categories: (1) those which are able to absorb salts from the saline habitat, and (2) those which do not absorb but are able to withstand high salinity, and are native to saline soils because they are not then in competition with salt-sensitive plants. This investigation was carried out to determine whether it is possible to use some of the native plants of Iraq as indicators for mineral elements composition of the soil in which they were grown, and to present examples of selectivity in the absorption and accumulation of mineral elements by native plants. Native vegetation of Iraq showed considerable variation in their ability to accumulate mineral elements. Some halophytes indicate very high sodium content in their soils such as Seidlitzia rosmarinus and Halocnemum strobilaceum. Selectivity in the uptake and accumulation of mineral elements was exhibited by native plants. This was indicated by high or low concentrations of some elements in a species in comparison with other species collected from the same site and at the same time. Magnesium and sulfur concentrations were as high as 5.80 and 4.06 percent respectively, when the concentrations in other species growing at the same sites were as low as 0.59 and 0.43 respectively. (See also W72-14868) (Black-Arizona)
W72-14869

HYDROLOGICAL AND SOIL PHYSICAL CONDITIONS IN A PILOT AREA IN THE GREATER MUSSAYEB PROJECT,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
A. I. Hawa, A. Ishaq, H. A. Hassan, J. Z. Al-Rawi, and J. S. Dougrameji.
Iraq Ministry of Higher Education, Council for Scientific Research, Technical Report No 17, 1970, 43 p. 1 tab, 14 fig, 5 ref.

Descriptors: *Arid lands, *Saline soils, *Soil texture, *Soil physical properties, *Hydrology, *Hydrogeology, *Subsurface mapping, *Irrigated programs, Mapping, Groundwater, Water table, Salinity, Porosity, Permeability, Hydrography, Subsurface waters, Geomorphology, Irrigated land, Land reclamation, Irrigation canals.
Identifiers: Greater Mussayeb Project (Iraq), *Iraq.

The Greater Mussayeb Project is situated in the lower floodplain of the Mesopotamian Plain between the Euphrates and Tigris rivers, about 65 km south of Baghdad, Iraq. It comprises a total area of some 80,000 ha which is irrigated with Euphrates water. This study was conducted in a sample area of 1500 ha in the northwest part of the Project for the purpose of obtaining detailed information on the hydrological and soil physical conditions in order to develop a reclamation program designed to restore agricultural production potential. Involved were a total of 61 augerings down to groundwater to determine the depth of the water table and the salinity of the groundwater itself. From these measurements, a water table contour map and a groundwater salinity map were constructed. Results indicate that soils in the Greater Mussayeb Project are pedogenetically immature, moisture characteristics are generally related to soil texture, maximum available plant moisture is found in medium to moderately fine textured soils, and occurence of highly saline groundwater at depths from 150-200 cm causes rapid salinization largely from improper drainage conditions. Information on general physiography, soil texture, soil porosity, soil permeability, and drainage patters is included. (Black-Arizona)
W72-14871

COMPARATIVE STUDIES OF PLANT GROWTH AND DISTRIBUTION IN RELATION TO WATERLOGGING, IV THE GROWTH OF DUNE AND DUNE SLACK PLANTS,
University Coll. of South Wales and Monmouthshire, Cardiff.
For primary bibliographic entry see Field 02I.
W72-14874

SOIL AND WATER RESEARCH TO MANAGE THE ENVIRONMENT,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05G.
W72-14891

NITRATE LEACHING UNDER BARE FALLOW AT A SITE IN NORTHERN NIGERIA,
Reading Univ. (England). Dept. of Soil Science.
A. Wild.
Journal of Soil Science, Vol 23, No 3, p 315-324, September 1972. 2 fig, 5 tab, 25 ref.

Descriptors: *Leaching, *Nitrates, *Fertilizers, Adsorption, Porosity, Infiltration, Soil physical properties, Soil chemical properties, Permeability, Nitrification.
Identifiers: *Nigeria.

In northern Nigeria, on a site under bare fallow nitrate formed from soil organic matter persisted in the top 120 cm of the soil profile throughout most of the rainy season. The rainfall in the two years was 1199 and 973 mm. Slow leaching was caused by adsorption on to positive charges in the textural B horizon, high rainfall intensities, and the presence of cracks and channels in the soil, down which water will pass quickly without leaching the newly mineralized nitrate. This nitrate diffuses relatively slowly through the aggregates or is carried downwards by water moving in the small pores. Leaching of nitrate added to the surface as fertilizer would be more rapid than that of nitrate formed from soil organic matter within the aggregates. (Knapp-USGS)
W72-14942

HYSTERESIS IN THE MOISTURE CHARACTERISTICS OF CLAY SOIL,
Manchester Univ. (England). Simon Engineering Labs.
G. Pavlakis, and L. Barden.
Journal of Soil Science, Vol 23, No 3, p 350-361, September 1972. 6 fig, 2 tab, 25 ref.

Descriptors: *Hysteresis, *Soil water movement, *Permeameters, *Clays, Saturation, Permeability, Soil physical properties, Soil moisture, Percolation, Unsaturated flow.

The relation between soil suction, degree of saturation, and the air and water permeabilities was experimentally investigated for two clay soils. Marked hysteresis can exist between saturation and permeability, but does not follow a unique trend. Thus permeability can be greater on a wetting or drying cycle depending on the structure of the clay soil. This behavior was considered in terms of the cluster concept of soil structure, and it is concluded that any general theory of hysteresis must recognize both the macrostructure and microstructure of a soil. (Knapp-USGS)
W72-14943

AN INTERPRETATION OF RESERVOIR SEDIMENTATION. II. CLAY MINERALOGY,
California Univ., Riverside.
For primary bibliographic entry see Field 02J.
W72-14944

FEASIBILITY STUDY OF CHEMICAL SEALING OF SOILS,
Diamond Alkali Co., Painesville, Ohio.
For primary bibliographic entry see Field 05B.
W72-15000

2H. Lakes

GEOCHEMISTRY OF FERROMANGANESE OXIDE CONCRETIONS AND ASSOCIATED DEPOSITS IN LAKE ONTARIO,
Ottawa Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02K.
W72-14202

AVAILABILITY OF FOOD AND SPAWNING GROUNDS IN LAKE LADOGA FOR THE PIKE-PERCH (LUCIOPERCA LUCIOPERCA),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
R. A. Rizvanov.
Vopr Ikhtiol. Vol 11, No 4, p 735-739. 1971. Map.
Identifiers: Availability, *Lake Ladoga, Lucioperca lucioperca, *Perches, *Pike-perch, Spawning, USSR, Fish diets.

Analysis of the food supply and spawning grounds in Lake Ladoga for L. lucioperca, showed that the yield of this fish can easily be increased. At the present time only about 8.4% of the possible spawning grounds are utilized by the pike-perch. The adults feed on frostfish, whitefish, roach, perch and striped perch. The young feed on Mysidae, zooplankton, frostfish, pike and Lake

Ladoga whitefish. The species which serve as food for the young and the adult pike-perch are in good supply.--Copyright 1972, Biological Abstracts, Inc.
W72-14321

OPTIMUM RESERVOIR OPERATION USING STOCHASTIC DYNAMIC PROGRAMMING,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 04A.
W72-14347

STRATIGRAPHIC RECORD OF POLLUTION IN SHAGAWA LAKE, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W72-14349

SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 05G.
W72-14377

HEATED-EFFLUENT DISPERSION IN LARGE LAKES: STATE-OF-THE-ART OF ANALYTICAL MODELING. PART 1. CRITIQUE OF MODEL FORMULATIONS,
Agronne National Lab., Ill. Center for Environmental Studies.
For primary bibliographic entry see Field 05B.
W72-14409

GROWTH INVESTIGATION OF RUFFE (ACERINA CERNUA L.) IN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
P. Biro.
Ann Inst Biol (Tihany) Hung Acad Sci. 38: p 131-142. 1971. Illus.
Identifiers: *Perches, Acerina cernua, *L:ke Balaton, *Growth rates, Hungary, Lakes, *Ruffe.

The growth rate of ruffe was investigated by scalimetric measurements in Lake Balaton. Annual rings of the scales are regularly formed in the majority of cases, accessory rings are rare, whereas injured, regenerated scales are frequent. A linear connection exists between the standard length and the total oral radius of the scales. The specific values of body weight calculated on the basis of the parabola describing the allometric relation of body length and weight for both sexes hardly differ from those obtained by direct measurements. The value of the allometric exponent is 3.0855. The growth of ruffe is slow in Lake Balaton. It is about the same rate in the first 4 yr (up to age group 3+). The slow growth probably bears a direct relation to the amount of food. Among the mathematical models applied for the description of the growth rate of the standard length, Kruger's (1965) proved more reliable than Bertalanfey's (1957). However, there are no great differences between the values calculated by the 2 methods. The growth rate of standard length and weight of ruffe in Lake Balaton is slower as compared to those of waters abroad. It is near to the values observed in the waters of Czechoslovakia.--Copyright 1972, Biological Abstracts, Inc.
W72-14415

THE PLAN FOR RECREATION DEVELOPMENT,
National Park Service, Western Regional Office. San Francisco, Calif.
For primary bibliographic entry see Field 06B.
W72-14421

PROCEEDINGS OF CONFERENCE ON INLAND LAKE RENEWAL AND SHORELAND MANAGEMENT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 05G.
W72-14439

DAILY AND SEASONAL DRIFT OF ORGANISMS IN A WARMWATER STREAM,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02I.
W72-14440

DIURNAL CHANGES IN THE SCHOOLING BEHAVIOR OF CERTAIN SPECIES OF LAKE BAIKAL FISHES,
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsh (USSR).
L. A. Volkova.
Vopr Ikhtiol. Vol 11, No 4, p 707-719. 1971.
Identifiers: *Lake Baikal, Coregonus autumnalis migratorius, Cottocomephorus grewingki, *Diurnal change, *Fishes, Lake, Leuciscus leuciscus baicalensis, Perca fluviatilis, Rutilus rutilus lacustris, *Schooling behavior, Thymallus arcticus baicalensis, USSR.

Investigations were conducted on the diurnal school behavior in Lake Baikal of the following fishes: Coregonus autumnalis migratorius, Cottocomephorus grewingki, Leuciscus leuciscus baicalensis, Rutilus rutilus lacustris, Thymallus arcticus baicalensis, and Perca fluviatilis. Complete dissolution of the schools occurred in the evening when the lumination fell to about 0.1 lux. This was the same intensity of illumination in the morning which resulted in school formation. Thus, this degree of illumination seems to serve as a signal for the formation and break-up of schools which requires not more than 20-30 min. During ontogenesis the schooling behavior of the younger fishes differs from that of the mature adults, and satiate fishes formed schools more readily than did hungry fishes.--Copyright 1972, Biological Abstracts, Inc.
W72-14529

A WATER QUALITY MANAGEMENT STRATEGY FOR THE GREAT LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.
W72-14544

ANNOTATED BIBLIOGRAPHY ON GREAT LAKES HYDROLOGY,
Illinois Univ., Urbana. Water Resources Center.
L. B. Buetikofer, and D. D. Meredith.
Available from the National Technical Information Service as PB-212 251, $4.50 paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 56, 1972. 62 p. OWRR B-062-ILL (1).

Descriptors: *Great Lakes, Precipitation (Atmospheric), Evaporation, Runoff, *Hydrologic budget, Water temperature, *Bibliographies, Currents (Water), Winds, *Lake stages.
Identifiers: Lake levels.

This bibliography contains 233 literature references on Great Lakes hydrology. The references are listed alphabetically by author for the following topics: precipitation; evaporation; runoff; lake levels and flows; hydrologic budget; currents, winds, and water temperature; and general.
W72-14681

ICHTHYOMASS AND FISH NUMBERS IN A ROACH AND PERCH LAKE (M RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
G. P. Rudenko.
Vopr Ikhtiol. Vol 11, No 4, p 630-642. 1971. Illus.
Identifiers: *Fish populations, *Demenets Lake, Esox lucius, Fish, Ichthyomass, Lakes, Numbers, Perca fluviatilis, *Perches, Roach, Rutilus rutilus, USSR.

The ichthyomass and number of fishes were studied in Demenets Lake in the Pskov region in July of 1961 on the basis of catch and following treatment of the lake with poly-chloropipene (an ichthyocide). Roach (Rutilus rutilus) and perch (Perca fluviatilis) were the dominant species in the lake, followed by pike (Esox lucius). Results of the studies obtained with numerical evaluation of the killed fishes showed that the ichthyomass in the lake amounted to 193 kg/ha, and the annual increment in the ichthyomass amounted to 57.3 kg/ha (29.6%). The corresponding values obtained when yearlings and 2 yr olds were included came to 228 kg/ha, and 98.3 kg/ha (42.9%), respectively.--Copyright 1972, Biological Abstracts, Inc.
W72-14709

A SYNOPTIC STUDY FOR EVALUATING THE ROLE OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
J. MacDowall.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 600-612, 4 fig, 12 ref.

Descriptors: *Great Lakes, *Limnology, *Climatology, *Water balance, International Hydrological Decade, United States, Canada, Dispersion, Water circulation, Water temperature, Evaporation, Heat balance, Weather forecasting, Water resources development.
Identifiers: *International Field Year for the Great Lakes.

The International Field Year for the Great Lakes (IFYGL) is a synoptic study of the Lake Ontario basin being conducted jointly by the USA and Canada. The program aims at better understanding of lake currents, dispersion, mass movement and thermal structure to assist in water quality modelling studies and in assessing the effects of effluents; at improving knowledge of relationships between inflows and outflows within the basin to better lake management techniques; at the establishment of better methods of measuring heat, vapour and momentum exchanges between the lake and the atmosphere for forecasting wind-driven currents and to help improve weather forecasts; and to define the climatic effects of the lakes with a view to future planning and development of shoreline areas. Four main scientific programmes are being carried out: water movements, meteorology, energy balance, and terrestrial water budget. The IFYGL, now in its fourth year, is moving to the implementation phase with the appointment of task forces to execute the scientific programme. (Knapp-USGS)
W72-14719

THE USE OF PHOTOGRAPHY IN WATER QUALITY RESEARCH,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05A.
W72-14728

FOUR-DIMENSIONAL MODEL FOR BEACH AND INNER NEARSHORE SEDIMENTATION,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 02J.
W72-14735

THE PATHOLOGY OF LAKE ERIE,
For primary bibliographic entry see Field 05G.
W72-14782

THE INFLUENCE OF VARIOUS CONCENTRATIONS OF NATURAL FOOD ON THE DEVELOPMENT, FECUNDITY AND PRODUCTION OF PLANKTONIC CRUSTACEAN FILTRATORS,
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
For primary bibliographic entry see Field 05C.
W72-14799

SEGREGATION BETWEEN ADULT CUTTHROAT TROUT (SALMO CLARKI) AND DOLLY VARDEN (SALVELINUS MALMA) IN SMALL COASTAL BRITISH COLUMBIA LAKES,
British Columbia Dept. of Recreation and Conservation, Cranbrook. Fish and Wildlife Branch.
H. Andrusak, and T. G. Northcote.
J Fish Res Board Can, Vol 28, No 9, p 1259-1268, 1971, Illus, Map.
Identifiers: *Trout, *Fish diets, *Fish behavior, British Columbia, Canada, Coasts, Lakes, Plankton, Salmo clarki, Salvelinus malma, Segregation.

Comparison of spatial distributions and food of allopatric populations of S. clarki and S. malma in 2 lakes and of sympatric populations in a third lake suggested interactive segregation. Allopatric cutthroat changed their depth distribution throughout the spring and summer but no diel migration was noted. Changes in food habits closely corresponded to seasonal changes in vertical distribution. A wide range of food organisms was eaten from surface, midwater, and benthic sources. Allopatric Dolly Varden underwent diel changes in spatial distribution, with many being caught in onshore waters near the surface at night. They were absent from such areas in the day, apparently occupying offshore waters at greater depths. Their diet throughout summer consisted largely of surface insects and zooplankton, with lesser amounts of bottom fauna. Sympatric cutthroat trout and Dolly Varden were spatially segregated throughout the summer. Cutthroat trout occurred and fed mostly near the surface in littoral areas. In contrast, Dolly Varden were offshore and benthic in distribution and fed primarily on bottom organisms. By comparing distribution and food habits in allopatric and sympatric populations, it was suggested that competition for food may contribute to their segregation in sympatry. Although segregation of these species when conhabiting may involve interactive processes, the possibility of selective differences being of importance cannot be dismissed.--Copyright 1972, Biological Abstracts, Inc.
W72-14801

SOME DATA ON THE ROLE OF FOOD IN THE BIOLOGY OF EUDIAPTOMUS ZACHARIASI POPPE,
Instytut Rybactwa Srodladowego, Warsaw (Poland).
For primary bibliographic entry see Field 05C.
W72-14805

THE DEPENDENCE OF PRIMARY PRODUCTION UPON PHYSICAL AND CHEMICAL FACTORS IN A SMALL, SENESCING LAKE, INCLUDING THE EFFECTS OF COMPLETE WINTER OXYGEN DEPLETION,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.; and North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 05C.
W72-14806

THE TOXICITY OF MICROCYSTIS AERUGINOSA KUTZ FROM SOME ENGLISH RESERVOIRS,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W72-14824

HYDROBIOLOGY OF SOUTHEASTERN LAKES: PHYSICOCHEMICAL CHARACTERISTICS OF THE WATERS,
Bordeaux Univ. (France). Lab. of Botany.
For primary bibliographic entry see Field 05C.
W72-14825

OVOGENESIS AND MATURATION OF THE BLUE BREAM (ABRAMIS BALLERUS) IN THE KIEV RESERVOIR,
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
N. A. Konstantinova, and V. L. Zubenko.
Vopr Ikhtiol. Vol 11, No 4, p 744-749. 1971. Illus.
Identifiers: *Fish reproduction, Fish physiology, Abramis ballerus, *Blue bream, Maturation, Ovogenesis, Kiev Reservoir, USSR.

Ovogenesis and sexual maturation were studied on 198 female A. ballerus from April through Oct., 1968, in the Kiev Reservoir. The specimens were 2.7 yr old, 17-35 cm in length, and weighed 70-650 g. Histologic determinations showed that from April-June the post-spawning stage of maturation was VI or VI-II, and there was resorbtion of the empty follicles and remaining ovocytes; the coefficient of maturation was 1.3-1.4%. At the end of June-Aug. a new generation of ovocytes appeared, there was vacuolization and accumulation of yolk; the stage of sexual maturation was III and the coefficient of maturation was 2-3%. Ovaries were in the IVth stage of maturation in the Sept.-April phase and the ovocytes were filled with yolk. The coefficient of maturation was 4-7% in Oct. and 8-12% in April. Large scale sexual maturation in the blue bream females takes place when they are 4 yr old and attain a length of 23-26 cm. A small fraction of the population attains sexual maturity at the age of 3 yr and an average length of 21 cm. The increase in the spawning capabilities of the reservoir population in comparison with the river populations of the blue bream is due to increased rate of growth and fecundity and not to increased rate of sexual maturation.--Copyright 1972, Biological Abstracts, Inc.
W72-14849

QUANTITATIVE INVESTIGATIONS ON MICROPHYTOBENTHOS IN 25 TRANSVERSE SECTIONS OF LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
G. Tamas.
Ann Inst Biol (Tihany) Hung Acad Sci. 38:p269-283. 1971. Illus. Maps.
Identifiers: *Algae, *Lake Balaton, Benthos, Chlorophyta, Chrysophyta, Cyanophyta, Euglenophyta, Hungary, Mycophyta, Pyrrophyta.

In 175 mud samples collected on 25 transverse sections of the lake in Sept., 1968, 108 spp. of algae were identified showing the following distribution: Cyanophyta 12; Euglenophyta 4; Pyrrophyta 1; Chrysophyta 68; Chlorophyta 22; Mycophyta 1. Some of the identified species were more frequent in the southwestern while others in the northeastern part of the lake.--Copyright 1972, Biological Abstracts, Inc.
W72-14859

FOUR PROBLEM AREAS,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 05C.
W72-14908

ERIE HARBOR, PENNSYLVANIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14927

DEEP LAKE, CAPE BARNE, ANTARCTICA,
Institute of Nuclear Sciences, Lower Hutt (New Zealand).
For primary bibliographic entry see Field 02C.
W72-14958

2I. Water in Plants

PLANT POPULATION EFFECTS ON THE EFFICIENT USE OF WATER: WATER UPTAKE CHARACTERISTICS,
Agricultural Experiment Station, Stillwater. Okla.
For primary bibliographic entry see Field 03F.
W72-14433

DAILY AND SEASONAL DRIFT OF ORGANISMS IN A WARMWATER STREAM,
Illinois Univ., Urbana. Water Resources Center.
R. W. Larimore.
Available from the National Technical Information Service as PB-212 266, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 55, July 1972. 105 p, 25 fig, 5 tab, 10 ref, 4 append. OWRR B-001-ILL (1).

Descriptors: Winds, Rain, Light, *Illinois, *Invertebrates, *Aquatic drift, *Seasonal, Impoundments, Water quality, Turbidity, Water temperature, Water level, Aquatic animals.
Identifiers: *Kaskaskia River (Ill), Stream drift organisms, *Diel cycles, *Annual cycles, Fish feeding habits.

The drift of stream organisms in the Kaskaskia River was investigated over a 2-year period and associated with the time of day, season of the year, turbidity, temperature, water level, and several other environmental factors. The amount and composition of drift showed definite diel and annual patterns. The diel cycle was characterized by a drastic increase in abundance of drifting organisms with the evening reduction of light intensity and a decline in abundance with an increase in light in the very early morning. The annual pattern shows an increase during the spring and into the summer with a gradual decline in the late fall to very low numbers of drift organisms during the winter months. The occurrence of terrestrial organisms in the drift was influenced strongly by heavy rain and strong winds and showed an increase during the autumn when leaves were falling into the water. A mainstream impoundment changed the composition and abundance of drift and contributed great amounts of fish food to the river. Diel and seasonal changes were obvious also in drift coming from the reservoir. Drifting organisms comprised a substantial part of food supplies of river fishes. Drift did not seem to be modified by the minor differences in water quality found along the Kaskaskia River but was demonstrated to be a good index of pollution in an adjacent watershed.
W72-14440

AVAILABILITY OF SOIL MOISTURE (BESCHIKBAARHEID VAN WATER IN DE GROND),
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 02G.
W72-14528

DYNAMICS OF METABOLISM IN THE CARP (CYPRINUS CARPIO) DURING HIBERNATION,
State Research Inst. of Lake, River Pisciculture, Volgograd (USSR).

I. E. Moroz.
Vopr Ikhtiol. Vol 11, No 4, p 702-706. 1971.
Identifiers: *Carp, Cyprinus-Carpio, *Hibernation, *Metabolism, USSR.

Metabolic dynamics were evaluated for hibernating C. carpio during the winter of 1968-69 in the Volgograd region. Determination of the concentration of protein, nonprotein nitrogen, ATP phosphorus, fat, glycogen, glucose and fructose in the muscle and liver showed that during this winter, which was unusally severe with ice in the ponds attaining a thickness of 75 cm, metabolism was greatly depressed and the fish were able to commence active life in the spring with greater energy reserves than is commonly the case. Energy expenditures during hibernation were primarily at the expense of the liver and muscle glycogen and glucose.--Copyright 1972, Biological Abstracts, Inc.
W72-14682

ECO-PHYSIOLOGICAL STUDIES ON SEED GERMINATION OF DESERT PLANTS OF RAJASTHAN: I. PONGAMIA PINNATA VENT,
Udaipur Univ. (India). Dept. of Botany.
K. D. Ramdeo.
Jap J Ecol. Vol 20, No 1: p 26-30. 1970. Illus.
Identifiers: *Plant physiology, *Germination, Ammonium chloride, Desert, India, Intensity, Light, Plants, Pongamia pinnata D, Potassium, Rajasthan, Seeds, Temperature.

Imbibition and germination were both 100% in ordinary laboratory conditions of light and temperature within 4-5 days. Seeds were subjected to different intensities of light such as artificial light, diffused light; darkness; colored light (red,yellow, green and blue) and the germination behavior noted. Seeds were also treated with growth-promoting chemicals such as NH4Cl. Root/shoot ratio and oven-dry weight were also studied in detail.--Copyright 1972, Biological Abstracts, Inc.
W72-14794

INCREASED PREDATION BY THE TORRENT SCULPIN, COTTUS RHOTHEUS, ON COHO SALMON FRY, ONCORHYNGHUS KISUTCH, DURING MOONLIGHT NIGHTS,
National Marine Fisheries Service, Seattle, Wash. North Pacific Fisheries Research Center.
B. G. Patten.
J Fish Res Board Can, Vol 28, No 9, p 1352-1354, 1971, Illus.
Identifiers: *Predation, *Moonlight, Cottus rhotheus, Fry, Oncorhynchus kisutch, *Salmon, Sculpin.

In stream aquaria, the percentages of coho salmon fry removed by the torrent sculpin averaged 70 in 4 tests on moonlight nights and 24 in 7 tests on dark nights.--Copyright 1972, Biological Abstracts, Inc.
W72-14811

THE PRODUCTIVITY OF ATTACHED ALGAE IN RIVER, (IN JAPANESE),
Research Inst. for Natural Resources, Tokyo (Japan).
For primary bibliographic entry see Field 05C.
W72-14821

RELATIONSHIPS BETWEEN THE AMOUNT OF TRANSPIRATION AND THE STOMATE OPENING OF SOME PHANEROPHYTES FROM THE ZAGREB FOREST (YUGOSLAVIA),
Institut za Botaniku, Zagreb (Yugoslavia).
For primary bibliographic entry see Field 02D.
W72-14828

PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF PLANTS TO DIFFERENT INTERNAL WATER POTENTIALS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
E. J. Kinbacher, C. Y. Sullivan, and J. D. Eastin.
Available from the National Technical Information Service as PB-212 378, $3.00 in paper copy, $0.95 in microfiche. Nebraska Water Research Institute, Lincoln, Project Completion Report, July 1972. 52 p, 9 tab, 9 fig, 69 ref. OWRR A-015-NEB (1).

Descriptors: *Plant physiology, *Biochemistry, *Drought resistance, *Environmental effects, *Moisture stress, *Photosynthesis, *Drought tolerance, *Crop response, *Retardants, *Stomata, Growth stages, Physiological ecology, Respiration, Water untilization, Plant growth, Management, Diffusivity, Soil-water-plant relationships, Transpiration control.
Water potential.

Transpiration of plants accounts for a tremendous amount of water utilization under both irrigated and dryland conditions. Much attention has been given to measuring this loss, but relatively little attention has been given to controlling this loss by manipulating plant responses to different conditions of water availability, or to increase their efficiency in water utilization. Objectives of this study, from July 1, 1969 to June 30, 1972, were to gain an understanding of plant biophysical mechanisms and responses by: (1) analyzing the biochemi cal effects of internal water stress on physiological processes such as photosynthesis and respiration, and (2) analyzing the mechanisms by which plant water potentials and water use are controlled or influenced by the plants. 'Harvester' snapbeans (Phaseolus vulgaris L.) were used for these investigations. The effects of a growth retardant, succinic acid 2,2-dimethylhydrazide (Alar) on photosynthesis and water potentials of 'Red Kidney' snapbeans (Phaseolus vulgaris L.) were also studied. Wide differences were found in plant types to tolerate drought and heat. Stomata were found to close sooner in some species when under drought stress. Internal resistances became increasingly more important as stomata of a drought resistant sorghum hybrid from India responded rapidly to an initial reduction in leaf water potential, but only partially closed when rewatered and reexposed to drought conditions. A technique for evaluating plant desiccation tolerance and over-all drought resistance was established. (Black-Arizona)
W72-14835

INTERRELATION OF THE MORPHOLOGY AND PHYSIOLOGY OF A PLANT AND THE RESISTANCE TO FLOW OF WATER WITHIN A PLANT,
Connecticut Univ., Storrs. Inst. of Water Resources.
B. E. Janes, and G. W. Gee.
Available from the National Technical Information Service as PB-212 366, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1972. 7 p, 4 fig, 5 ref. OWRR A-034-CONN (1).

Descriptors: *Soil-water-plant-relationships, *Photosynthesis, *Root systems, *Moisture stress, Hydrostatic pressure, Photoperiodism, Transpiration, Resistance.
Identifiers: *Environmental stress, *Total plant resistance, Pepper plants, Corn plant.

Measurements were made of corn and pepper plants under environmental stress. Solid soil water potential was measured by a thermocouple psychrometer located in the root zone of each plant. Leaf water potential was inferred by pressure bomb readings. Transpiration of corn was measured by weight change, and pepper by microchamber. Water potential and transpiration were determined during periods of light and darkness. Light period resistance appeared relatively constant, dark period resistance was almost 5 times that of the light period. Resistances for partial darkness were found to have a total plant resistance lying between the light and dark period resistances. Pepper subjected to a drying cycle had a dark to light total plant resistance ratio of more than 20. Hydrostatic pressures were applied to roots growing in nutrient solution and rates of transpiration, net CO2 (--) assimilation and leaf temperatures were monitored in microchamber. With applied pressures of more than 2 bar, transpiration remained below original level as long as pressures were applied. On release of pressures there was a rapid increase in transpiration, followed by a decrease to a level much below the original level. Generally, net CO2 (--) assimilation responded similarly.
W72-14842

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): IX. SOME ASPECTS OF THE ECOLOGY OF ORLEANS COUNTY, NEW YORK,
E. Lyman, and B. B. Coleman.
Proc Rochester Acad Sci. Vol 12, No 2, p 160-232. 1971. Illus. Map.
Identifiers: *Plant populations, *New York, Orleans County (NY), Beech D, Ecology, Hardwoods, Hemlock G, Liverworts, Maple D, Mosses, Plants, Succession.

Tables showing the county distribution for mosses and liverworts collected and studied and for vascular plants observed, are presented. The genera of the group are arranged alphabetically, with the species of the genus similarly arranged. For each species of moss and liverwort the number of times it was collected in the several habitats is indicated. For the vascular plants a table shows the number of times a given species was observed in a habitat, based on the field records. Habitat type designations of the tables attempt to suggest the ecology of the collecting sites and broadly, therefore, of the county. They are adapted from Shanks for the present study. They represent the vegetation types evolved and apparent at the present time in the county. They suggest that the beech-sugar maple climax forest was extensive and that remnants of the hemlock-northern hardwoods, mixed mesophytic aspects of the latter, and also kinds of swamp forest still remain in evidence. The habitat designations also indicate the presence of successional stages in this vegetational development and represent some of the major seres which precede the climax forests above. Among these are bog forests, bogs, swamp shrub vegetation, marsh meadows, marshes, and emergent and submersed aquatic plants of hydrophytic habitats.--Copyright 1972, Biological Abstracts, Inc.
W72-14867

COMPARATIVE STUDIES OF PLANT GROWTH AND DISTRIBUTION IN RELATION TO WATERLOGGING, IV THE GROWTH OF DUNE AND DUNE SLACK PLANTS,
University Coll. of South Wales and Monmouthshire, Cardiff.
R. Jones, and J. R. Etherington.
Journal of Ecology, Vol 59, No 3, p 793-801, November 1971. 4 fig, 3 tab, 8 ref.

Descriptors: *Dunes, *Soil formation, *Arid lands, *Dune sands, *Sands, *Dune succession, *Laboratory tests, Plant growth, Saturation, Eluvium, Geomorphology, Soil investigations, Soil tests, Soil erosion, Grasses.

Sand dune systems with their alternation of dunes and slacks (spaces between dunes) present a sequence of conditions for soil formation and plant colonization which is strictly related to topography and is independent of the parent sand material. Gross differences between the dune and slack habitats are a reflection of differences in soil water regimes. An investigation of the effect of three different water regimes (waterlogged, half-waterlogged, and freely draining) on the growth of Agrostis stolonifera, Festuca rubra, Carex flacca, and Carex nigra, was made in pots of dune and

slack sand in a glasshouse. Waterlogging (simulated slack moisture regime) caused a reduction in soil compared with a freely draining control treatment (simulated dune moisture regime). Tiller production and root growth of the grasses were stunted by waterlogging, while growth of the Carices was not significantly affected. Growth of Carex flacca was greatest in the half-waterlogging treatment. (Black-Arizona)
W72-14874

AN EPILITHIC DIATOM COMMUNITY OF A NORTH CAROLINA SANDHILLS STREAM,
Western Kentucky Univ., Bowling Green. Dept. of Biology.
G. E. Dillard.
Rev Algol. Vol 10, No 2, p 118-127. 1971. Illus.
Identifiers: *Diatoms, Eunotia pectinalis var minor, *North Carolina, Sandhills, Seasonality, Streams, Water temperature.

A description is given of a permanent epilithic diatom community inhabiting rapids and high current velocity parts of a North Carolina sandhills stream. The dominant species was Eunotia pectinalis var. minor, and the community was termed the Eunotia-Tabellaria community. Water temperature appeared to be the primary factor responsible for seasonal changes of associated species.--Copyright 1972, Biological Abstracts, Inc.
W72-14875

A SURVEY OF THE PHREATOPHYTIC TREES OF THE REPUBLICAN RIVER VALLEY, NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 03B.
W72-14914

2J. Erosion and Sedimentation

GEOCHEMISTRY OF FERROMANGANESE OXIDE CONCRETIONS AND ASSOCIATED DEPOSITS IN LAKE ONTARIO,
Ottawa Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02K.
W72-14202

ENVIRONMENTAL CONSTRAINTS ON THE SUBSTITUTION OF SPACE FOR TIME IN THE STUDY OF NATURAL CHANNEL NETWORKS,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 02E.
W72-14203

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 08B.
W72-14205

COARSE SEDIMENT TRANSPORT BY FLOOD FLOWS ON KNIK RIVER, ALASKA,
Colorado Univ., Boulder. Dept. of Geological Sciences.
W. C. Bradley, R. K. Fahnestock, and E. T. Rowekamp.
Geological Society of America Bulletin, Vol 83, No 5, p 1261-1284, May 1972. 14 fig, 4 tab, 62 ref.

Descriptors: *Sediment transport, *Sediment sorting, *Glacial sediments, *Alluvial channels, *Alaska, Sedimentation, Erosion, Particle size, Particle shape, Sediment distribution, Gravels.
Identifiers: *Knik River (Alaska).

Knik River of southern Alaska is a glacial river with a valley train which was, until recently, swept each summer by a brief large flood resulting from the sudden draining of an ice-dammed lake (Lake George). These flows were 10 to 20 times larger than the postflood summer discharge of approximately 20,000 cfs and were responsible for the morphological and alluvial characteristics of the valley train. Flooding stopped after the 1966 season. During its first 16 mi of travel, where alluvial contamination from side streams is unimportant, the coarse fraction of the valley train changes systematically in size and shape. Grain size decreases by 94 percent. At the same time, specimens of quartz and graywacke become progressively more elongated, and foliated specimens show the same change initially, but then deviate to become progressively more platy. Downvalley changes in size and shape of coarse gravel are caused chiefly by sorting processes, aided by frost action which splits foliated particles into platy fragments. During shape-sorting, platy specimens are the most transportable, elongated specimens are intermediate, and compact (equidimensional) specimens are the least transportable. (Knapp-USGS)
W72-14207

DEEP EROSION BY CONTINENTAL ICE SHEETS,
North Carolina Univ., Chapel Hill. Dept. of Geology.
W. A. White.
Geological Society of America Bulletin, Vol 83, No 4, p 1037-1056, April 1972. 9 fig, 40 ref.

Descriptors: *Erosion, *Glaciers, *Glaciation, *Pleistocene epoch, Geomorphology, Glaciology, Glacial sediments, Glacial drift, North America, Europe, Great Lakes.
Identifiers: *Glacial erosion, *Ice sheets.

Erosion by continental ice sheets removed sedimentary cover to exhume some of the world's largest areas of exposed Precambrian crystalline rock. Of the world's large areas of exposed Precambrian rock, two were centrally located beneath great Pleistocene continental ice sheets that no longer exist, are proportionate to those ice sheets in size and similar in shape, and are great lowlands holding central seas. Around the Laurentian and Fennoscandian shields, arcs of exhumation control major topography and drainage. These are arcuate lowlands of continental scope encircling the shields at the Precambrian-Paleozoic contact where glaciation skinned Paleozoic rocks off crystalline basement. They are geometrically similar and are proportional in size to the ice sheets that excavated them. They form the St. Lawrence and upper MacKenzie valleys, including America's greatest lake basins-Great Bear, Great Slave, Athabaska, Reindeer, Winnipeg, Winnipegosis, Lake of the Woods, Rainy Lakes, Great Lakes, and St. Lawrence Trough. European counterparts are Skagerrak, Baltic, Gulf of Finland, Lakes Ladoga and Onega, Onega Bay, Gulf of Dvinsk, and White Sea. Erosion by the Laurentide and Fennoscandian ice sheets has carved great ellipsoidal basins. (Knapp-USGS)
W72-14208

TURBIDITE MUDS WITHIN DIATOM OOZE OFF ANTARCTICA: PLEISTOCENE SEDIMENT VARIATION DEFINED BY CLOSELY SPACED PISTON CORES,
South Carolina Univ., Columbia. Dept. of Geology.
R. R. Payne, J. R. Conolly, and W. H. Abbott.
Geological Society of America Bulletin, Vol 83, No 2, p 481-486, February 1972. 3 fig, 11 ref.

Descriptors: *Bottom sediments, *Antarctic, *Sampling, *Stratigraphy, *Turbidity currents, Deposition (Sediments), Sedimentation rates, Cores, Diatoms, Sediments, Sedimentation, Sedimentology.
Identifiers: Siliceous ooze, Turbidite muds.

To test the ability to correlate sediments in deep ocean basins, 5 piston cores were taken from one station on U.S.N.S. Eltanin cruise 44, in one of the deepest and flattest regions of the Wilkes Abyssal Plain off East Antarctica. The 5 cores are characterized by interbedded siliceous ooze and terrigenous turbidite mud beds. The siliceous ooze is characterized by burrow mottling and high (90 to 95 percent) diatom and radiolarina content. The terrigenous mud beds have sharp basal contacts, lack evidence of burrowing except in the upper 10 to 20 cm, and are 20 cm to 2.5 m thick. Correlations from one core to another were made using the relative stratigraphic position and sequence of pelagic and turbidite zones, and also by using three major diatom assemblage zones. Not only could major pelagic ooze and turbidite zones in the five cores be correlated over the short distance at the drift station, but they could also be correlated with zones found in a sixth core taken 55 km away. Rates of sedimentation for the pelagic zones are 1 cm per 1,000 yrs, and total sedimentation rates are 5 cm per 1,000 yrs. (Knapp-USGS)
W72-14209

VERTICAL MIXING OF ICE-RAFTED VOLCANIC ASH IN NORTH ATLANTIC SEDIMENTS,
Naval Oceanographic Office, Washington, D.C.
W. F. Ruddiman, and L. K. Glover.
Geological Society of America Bulletin, Vol 83, No 9, p 2817-2835, September 1972. 12 fig, 7 tab, 22 ref.

Descriptors: *Sedimentation rates, *Tracers, *Dusts, *Volcanoes, *Stratigraphy, Igneous rocks, Distribution patterns, Provenance, Ocean currents, Sediment transport, Winds.
Identifiers: *Volcanic ashfalls, *Sedimentary markers.

Three times in the last 620,000 yrs, highly silicic ash ejected from Icelandic or Jan Mayer volcanoes has been deposited in sediments over an area of several million square kilometers in the North Atlantic. Shards were initially deposited on ice cover on and near Iceland and later dropped from melting ice as far as 1,800 km to the south. Since the largest sand-sized shards cannot be that widely distributed by wind, they must be ice-rafted. The shards thus serve as localized injections into North Atlantic paleocirculation patterns, with the resulting geographic patterns of ash redistribution tracing the counterclockwise movement of the subarctic gyre. These geologically instantaneous ash falls are spread vertically through well-defined zones in cored sediments, providing models for vertical mixing of sand-sized microfossils. In cores with high sedimentation rates, strongly defined climatic spikes should be little disturbed: episodes of only 10 to 100 yrs duration will still be visible after mixing, and those lasting 1,000 to 5,000 yrs should be left largely intact. (Knapp-USGS)
W72-14210

MECHANISMS OF CLAST ATTRITION IN BASAL TILL,
Iowa Univ., Iowa City. Dept. of Geology.
L. D. Drake.
Geological Society of America Bulletin, Vol 83, No 7, p 2159-2165, July 1972. 2 fig, 4 tab, 15 ref.

Descriptors: *Glacial sediments, *Till, *Particle size, *Particle shape, *Provenance, Sedimentology, Regimen, Scour, Erosion, Glacial drift, Weathering, Sediment transport.
Identifiers: *Abrasion (Till), *Glacial erosion.

Sources of 1,852 basal till pebbles from sites in east-central New Hampshire were identified using measurements of pebble size, shape, roundness, breakage, lithology, and weathering. Roundness, breakage, and size distributions of the pebbles, when compared to their distance from source, indicate that a state of dynamic equilibrium is reached between the processes of abrasion and

crushing. The average pebble survives long enough to abrade to a roundness of .5 on Krumbein's scale, then is crushed again. The early attainment of this equilibrium within a mile of source, suggests that the clasts go through at least several cycles of crushing and abrasion per mile transport. Spheres are the most stable shapes, discs and rods less so, and blades are least stable in the subglacial environment. Abrasion and crushing are about equally effective mechanisms in the production of subglacial till. (Knapp-USGS)
W72-14212

SIGNIFICANCE OF ATMOSPHERIC DUST AND ICE RAFTING FOR ARCTIC OCEAN SEDIMENT,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
R. E. Mullen, D. A. Darby, and D. L. Clark.
Geological Society of America Bulletin, Vol 83, No 1, p 205-211, January 1972. 5 fig, 3 tab, 10 ref.

Descriptors: *Sedimentation, *Provenance, *Arctic Ocean, *Bottom sediments, *Glacial drift, Dusts, Particle size, Mineralogy, Sea ice, Sedimentation rates, Deposition (Sediments), Sediment distribution, Sediment transport.

Atmospheric dust fallout and ice-rafted glacial detritus are significant factors in the Arctic Ocean sediment budget. Atmospheric dust amounting to .09 mm/1000 yrs is being delivered to the Canada Basin, Chukchi Plain and Alpha Cordillera areas today. This is 10 percent of the sedimentation rate for some parts of the Arctic Ocean during the past 2 to 3 m.y. The modern atmospheric dust and the Arctic Ocean sediment is approximately 40 percent illite with almost equal amounts of chlorite and kaolinite. Ice-rafted detritus is widespread on the Arctic Ocean floor today. No pattern of lithologic and vertical distribution correlation of erratics is present. The oldest erratic occurs in sediment approximately 3.5 m.y. old. More than 30 percent of some Arctic sediment consists of particles larger than 62 microns. This is largely ice-rafted material. Together with the atmospheric dust fallout, this is a significant part of the average sedimentation rate of 2 to 3 mm/1,000. (Knapp-USGS)
W72-14213

GEOPHYSICAL STUDY OF UNCONSOLIDATED SEDIMENTS AND BASIN STRUCTURE IN CACHE VALLEY, UTAH AND IDAHO,
Geological Survey, Denver, Colo.
W. D. Stanley.
Geological Society of America Bulletin, Vol 83, No 6, p 1817-1830, June 1972. 15 fig, 11 ref.

Descriptors: *Geophysics, *Seismic studies, *Electrical studies, *Hydrogeology, Stratigraphy, Alluvium, Groundwater basins, Sediments, Sedimentology, Borehole geophysics, Gravity studies, Exploration, Subsurface mapping.
Identifiers: *Cache Valley (Idaho, Utah).

An integrated geophysical study was completed in Cache Valley near the state line between Utah and Idaho. The west side of Cache Valley is underlain by a trough which is about 5 mi wide and which is filled with as much as 7,000 ft of Quaternary and Tertiary sedimentary units. Magnetic data revealed a probable mafic dike intruded into Paleozoic and Precambrian bedrock in the Lewiston area and possibly a buried volcanic flow unit in the Tertiary sediments. Interpretations of 38 vertical electrical soundings supported by three well logs showed that an area of about 8 sq mi in the center of the surveyed area is underlain by conductive clays. Most of the area surveyed is underlain at depths of 100 to 500 ft by more resistive materials interpreted to contain a higher percentage of coarse-grained sediments. These sediments may constitute an aquifer. Seismic reflection data further confirmed the existence of the massive clays in the central part of the surveyed area, revealed complex sedimentary geology at the valley margins, and defined subtle structures within the valley fill. (Knapp-USGS)
W72-14214

THEORETICAL APPROACH TO THE ORIGIN OF BEACH CUSPS,
Western Washington State Coll., Bellingham. Dept. of Geology.
M. L. Schwartz.
Geological Society of America Bulletin, Vol 83, No 4, p 1115-1116, April 1972. 1 fig, 14 ref.

Descriptors: *Sediment transport, *Beaches, *Littoral drift, *Sand waves, Beach erosion, Surf, Waves (Water), Rip currents, Bed load, Sedimentary structures.
Identifiers: *Beach cusps.

Beach cusps are depositional over the beach surface, and their size increases with wave energy. A theoretical approach to their origin invokes littoral zone shore drift in the form of longshore sand waves. Shore drift occurs not as a sheet flow of sediment but as a series of evenly spaced sand waves or ripples transported longitudinally along the foreshore with their crests oblique to the shoreline. These sand waves in turn present a crest and trough relief profile to the swash and backwash operating in this zone. Swash-backwash reworking of the sediments comprising this microtopography fashions beach cusps. (Knapp-USGS)
W72-14215

RELATIVE SIGNIFICANCE OF HEAD AND BODY SPILL FROM A CHANNELIZED TURBIDITY CURRENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
P. D. Komar.
Geological Society of America Bulletin, Vol 83, No 4, p 1151-1155, April 1972. 3 fig, 15 ref.

Descriptors: *Turbidity currents, *Sediment transport, *Sedimentation, *Submarine canyons, *Deposition (Sediments), Density, Suspended load, Bed load, Alluvial fans, Alluvial channels, Turbulence.
Identifiers: *Submarine fans.

The relationship between the thickness and rate of flow of the head and body of a turbidity current traveling through a deep-sea fan channel governs which part spills out of the confines of the channel and is, therefore, important in submarine fan deposition. For a Froude number of about 0.75 (a channel slope of 0.0022), the head and the body will be approximately equal in thickness and, therefore, would both spill from the channel. At higher channel slopes and Froude numbers the head would be thicker and more significant in spilling, while at lower slopes and Froude numbers, the body would be thickest and spilling. (Knapp-USGS)
W72-14216

ORIGIN OF THE MORMON MESA CALICHE, CLARK COUNTY, NEVADA,
South Carolina Univ., Columbia. Dept. of Geology.
R. L. Gardner.
Geological Society of America Bulletin, Vol 83, No 1, p 143-155, January 1972. 7 fig, 2 tab, 37 ref.

Descriptors: *Caliche, *Nevada, *Diagenesis, *Soil formation, Calcium carbonate, Evaporation, Limestones, Chemical precipitation, Calcite, Stratigraphy, Mineralogy, Sedimentation rates.
Identifiers: *Mormon Mesa Caliche (Nev).

The Mormon Mesa caliche of Nevada formed primarily as the result of pedogenetic processes, probably under slowly aggrading, aeolian conditions. The reasons for postulating aggrading aeolian conditions are (1) the absence of A and B soil horizons, (2) the absence of laminated petrology horizons, (3) the lack of quartz grain dissolution and brecciation, (4) the relatively high content of clay and silt in the calcrete (caprock) horizon, (5) the presence of aeolian sand drifts on the present mesa surface, and)6) the presence of fresh red sand in joint fillings of laminated CaCO3. At least 25 percent of the secondary CaCO3 in the caliche was derived from dissolved Ca and HCO3 in rainwater, with the remainder probably furnished by aeolian carbonate dust. It is estimated that development of the caliche probably required at least 400,000 yrs and possibly as long as 2,500,000 yrs. (Knapp-USGS)
W72-14225

SIGNIFICANCE OF SUPRATIDAL DOLOMITIZATION IN THE GEOLOGIC RECORD,
Pomona Coll., Claremont, Calif. Dept. of Geology.
D. H. Zenger.
Geological Society of America Bulletin, Vol 83, No 1, p 1-11, January 1972. 9 fig, 52 ref.

Descriptors: *Diagenesis, *Deposition (Sediments), *Dolomite, *Carbonate rocks, Water chemistry, Sedimentation, Sedimentology, Stratigraphy, Paleohydrology, Paleoclimatology.
Identifiers: Dolomitization.

There is considerable evidence that much Holocene dolomite, as well as a substantial part of the dolomite in the geologic record, formed under evaporitic conditions, especially in contact with brines of high Mg/Ca ratios. However, findings in Holocene sediments as well as the lack of indication of the initial presence of evaporites in many ancient dolomites suggest that dolomite need not be an evaporitic mineral. Detailed field and laboratory studies of three dolomitic units in New York (Little Falls, Upper Cambrian; Herkimer, Middle Silurian; and Lockport, Middle Silurian) and one in California (Lost Burro, Middle and Upper Devonian) show that the dolomite, apparently metasomatic, represents original calcium carbonate sediments of variable environmental deposition. Portions of the Little Falls and Upper Lockport Formations contain evidence algal stromatolites, desiccation cracks, intraclasts) of tidal flat deposition, whereas the other occurrences (Herkimer, Lost Burro, and lower Lockport) contain evidence (bioherms, abundant open-marine fossils) of subtidal accumulation. Dolomitization is primarily diagenetic. (Knapp-USGS)
W72-14226

IRON AND CLAY IN TROPICAL SAVANNA ALLUVIUM, NORTHERN COLOMBIA: A CONTRIBUTION TO THE ORIGIN OF RED BEDS,
Princeton Univ., N.J. Dept. of Geological and Geophysical Sciences.
F. B. Van Houten.
Geological Society of America Bulletin, Vol 83, No 9, p 2761-2770, September 1972. 3 fig, 2 tab, 40 ref.

Descriptors: *Sediments, *Iron, *Tropical regions, *Clays, *Clay minerals, Diagenesis, Geochemistry, Sedimentation, Soil formation, Weathering, Leaching, Laterites, Humid climates, Alluvium, Mineralogy.
Identifiers: *Colombia, *Tropical savanna soils.

Along the flanks of Sierra Nevada de Santa Marta, northern Colombia, tropical savanna uplands with reddish to reddish-brown soils yield brown alluvium which contains relatively abundant grains of fresh iron-bearing minerals: magnetite, amphibole, and biotite, with subordinate chlorite and ilmenite. Clay minerals consist of varying amounts of mont-

morillonite, illite, mixed-layer clay, kaolinite, and chlorite. Amorphous to very disordered aluminosilicate constitutes 10 to 26 percent of the clay fraction. Total iron makes up 3.1 to 7.6 percent of bulk samples. This is considerably higher than the iron content in Sonoran Desert alluvium, and its upper range exceeds that in many ancient red beds. With few exceptions most of the total iron is in the clay fractions and about 75 percent of that is combined in clay minerals. There is enough free brown hydrated ferric oxide in tropical savanna alluvium to produce hematite pigment in a red bed simply by post-depositional dehydration and crystallization in an oxidizing environment of burial. (Knapp-USGS)
W72-14227

SEDIMENT REDISTRIBUTION ON THE REYKJANES RIDGE: SEISMIC EVIDENCE,
Naval Oceanographic Office, Washington, D.C.
W. F. Ruddiman.
Geological Society of America Bulletin, Vol 83, No 7, p 2039-2062, July 1972. 17 fig, 47 ref.

Descriptors: *Bottom sediments, *Atlantic Ocean, *Sediment transport, *Oceanography, *Seismic studies, Ocean currents, Turbidity currents, Topography, Stratigraphy, Sedimentation, Sedimentation rates.
Identifiers: *Reykjanes Ridge (Atlantic Ocean).

East-West seismic reflection lines were obtained at 14-km intervals on the eastern flank of the Reykjanes Ridge. Patterns of sediment cover are controlled by the reaction of bottomwater movement to crustal topography. Bottom currents have piled sediment into drifts. Basement peaks with scoured and moated sedimentary envelopes, outcropping sedimentary strata, and dune topography indicate prevalent erosion and redeposition of bottom sediments. No conformable pelagic draping is visible. Two prominent sediment reflectors occur on crust as young as 17 m.y. and 37 m.y., which sets a maximum limit on their ages. Part of the fracture zone filling appears to be sediment redistributed by bottom currents, but the increased sediment smoothness and reflectivity in the fractures suggest localized turbid downslope flow within the ridge flank. In the last 5 to 10 m.y., coarse basaltic sand mainly from Iceland (at 64 degrees N.) has been spread across a broad trough-contained fan southwest of the Iceland-Faeroes Ridge. At 58 degrees N., the turbidite flow is funneled into Maury Channel, ultimately to be spread out onto the Biscay Abyssal Plain at and below 48 degrees N., 1,600 km to the south. (Knapp-USGS)
W72-14228

ALPINE SUBNIVAL BOULDER PAVEMENTS IN COLORADO FRONT RANGE,
Ohio State Univ., Columbus. Dept. of Geology.
S. E. White.
Geological Society of America Bulletin, Vol 83, No 1, p 195-200, January 1972. 3 fig, 10 ref.

Descriptors: *Geomorphology, *Alpine, *Colorado, *Sediment sorting, *Firn, Glaciers, Ice, Snowpacks, Cirques, Rock glaciers, Valleys, Topography, Glaciation.
Identifiers: *Boulder pavements, *Front range (Colo).

Boulder pavements on valley floors in or near stream channels, downstream from breaks in slope, beneath persistent snowbanks, and above treeline occur in four glaciated valleys east of the Continental Divide, Boulder District, Colorado Front Range. They are at altitudes of 3,230 to 3,620 m, are triangular to rectangular in ground plan, slope a few degrees downvalley with nearly all blocks or boulders tightly packed with a flat face upward, and are made of local bedrock or till. These pavements may be formed by the joint effort of frost action, meltwater saturation and removal of fine sediment with rotation and flattening of blocks by rock weight, snow pressure and snow creep. (Knapp-USGS)
W72-14229

DISCRIMINANT ANALYSIS OF BERMUDA CARBONATE STRAND-LINE SEDIMENT,
Michigan State Univ., East Lansing. Dept. of Geology.
S. B. Upchurch.
Geological Society of America Bulletin, Vol 83, No 1, p 87-94, January 1972. 4 fig, 5 tab, 29 ref.

Descriptors: *Beaches, *Sedimentology, *Particle size, *Sediment sorting, *Carbonates, Surf, Waves (Water), Statistical methods, Sediment distribution, Regimen, Regime, Dunes, Mineralogy.
Identifiers: *Discriminant analysis, *Bermuda.

Discriminant function analysis is an effective tool for differentiation of strand-line environments. Sediment samples from the beaches of Bermuda were separated on the basis of wave energy regime and tidal position: subtidal, intertidal, and supratidal (DUNE AND EOLIAN FLAT). Sediment from the beaches that face the lagoon is composed of fragments of (1) the green alga, Halimeda, (2) bivalves, and (3) Pleistocene, skeletal eolianite. Sediment from beaches that face the open ocean is composed of fragments of (1) the Foraminifera, Homotrema, (2) coral, (3) coralline algae, and (4) Pleistocene, skeletal eolianite. Differences in sediment texture and ability to discriminate depositional environments are related to skeletal composition of the sediment and to wave-energy regime. The combination of phi mean, phi standard deviation, skewness, and kurtosis is most efficient for separating all categories of strand sediment by discriminant analysis. Phi mean and standard deviation combined are also efficient variables for discrimination. (Knapp-USGS)
W72-14230

METHOD FOR STUDYING GEOCHEMISTRY OF SEDIMENT-WATER INTERFACE,
Stockholm Univ. (Sweden). Dept. of Geology.
For primary bibliographic entry see Field 05A.
W72-14302

DEVELOPMENT OF ALLUVIAL STREAM CHANNELS: A FIVE-STAGE MODEL,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
E. A. Keller.
Geological Society of America Bulletin, Vol 83, No 5, p 1531-1536, May 1972. 6 fig, 2 tab, 11 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Meanders, *Sediment transport, *Model studies, Sedimentation, Regime, Stream erosion, Scour, Braiding, Sediment load, Bed load.

Pools, riffles, and point bars are common bed forms in straight and meandering channels. Inflections in meandering channels correspond to riffles in straight channels. Both of these forms are shoals that are symmetrical across the channel for a short distance. Pool-riffle spacing appears to be independent of channel pattern, and as straight reaches merge with meandering reaches no change occurs in the spacing, form, or symmetry of the pools and riffles. Meandering processes which result in increasing channel length may result in the addition of new pools to keep spacing constant. A five-stage model is proposed to explain the development of alluvial channels. The model is based upon channel morphology, channel morphometry, and qualitative conclusions based on numerous field observations. (Knapp-USGS)
W72-14348

STRATIGRAPHIC RECORD OF POLLUTION IN SHAGAWA LAKE, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W72-14349

SEDIMENTS OF THE CONTINENTAL MARGIN OFF THE EASTERN UNITED STATES,
Woods Hole Oceanographic Institution, Mass.
J. D. Milliman, O. H. Pilkey, and D. A. Ross.
Geological Society of America Bulletin, Vol 83, No 5, p 1315-1333, May 1972. 14 fig, 2 tab, 81 ref.

Descriptors: *Sediments, *Continental shelf, *Atlantic coastal plain, *Provenance, Sediment transport, Sedimentation, Littoral drift, Pleistocene epoch, Sediment load, Sands, Beaches, Beach erosion, Sedimentology, Sediment yield, *Atlantic Ocean.
Identifiers: Continental margin.

The character and distribution of surficial sediments on the continental shelf and slope between northern Maine and southern Florida is defined on the basis of more than 6,000 bottom samples. Most shelf sediments were deposited in shallow water during the last lower stand of sea level. Modern sediments are accumulating only in estuaries, in certain nearshore areas and on the continental slope. A large portion of the shelf sediment north of lat 41 degrees N. was deposited by Pleistocene glaciers that covered the area. Holocene reworking has removed most fine-grained sediment, leaving only coarse to medium sand. Some fine-grained fluvial sediment escapes the estuaries and nearshore during floods and storms, but this influx is not sufficient to offset the effect of winnowing by currents and waves. A significant portion of the modern nearshore sediment is probably derived from landward transport of fine-grained sediment from the central and outer shelf. Despite the active sediment movement on the shelf, the net lateral transport of sand and gravel is small. Because of the lack of present-day terrigenous sedimentation a primary source of modern shelf sediment is calcareous skeletal material. (Knapp-USGS)
W72-14350

SOME MOVEMENT PATTERNS OF TEMPERATE MUDFLOWS: EXAMPLES FROM NORTHEASTERN IRELAND,
Queens Univ., Belfast (Northern Ireland). Dept. of Geography.
D. B. Prior, and N. Stephens.
Geological Society of America Bulletin, Vol 83, No 8, p 2533-2543, August 1972. 8 fig, 10 ref.

Descriptors: *Mudflows, *Mass wasting, *Sediment transport, Landslides, Rainfall, Soil water, Degradation (Slope), Soil erosion, Soil mechanics.
Identifiers: *Temperate mudflows, *Ireland.

Movements of some temperate mudflows in Ireland were automatically monitored using modified water-level recorders. A complex variety of recorded movement patterns shows that pronounced accelerations and decelerations occur. Surges of movement of varying magnitude and relatively high rates of movement exceeding 2.8 m/hr may take place. Comparisons between rainfall data and movements suggest that rainfall has important effects on the behavior of temperate mudflows because pronounced accelerations of movement usually follow periods of rainfall, although surges may take place unaccompanied by heavy precipitation. (Knapp-USGS)
W72-14352

RIVER MOUTH AND BEACH SEDIMENTS -- RUSSIAN RIVER, CALIFORNIA TO ROUGE RIVER, OREGON. PART A, INTRODUCTION AND GRAIN SIZE ANALYSES,
California Univ., Berkeley. Coll. of Engineering.

M. Glogoczowski, and P. Wilde.
Available from NTIS, Springfield, Va 22151 AD-735 373, Price $3.00 paper copy; 95 cents microfiche. Hydraulic Engineering Laboratory Report HEL 2-36, November 1971. 73 p, 4 ref.

Descriptors: *Sedimentology, *Sands, *Beaches, *California, *Oregon, Coasts, Continental shelf, Sampling, Particle size, Analytical techniques, Sediments, Sediment transport, Sand bars, Projections, Curves, Statistical methods.

Sand samples of intertidal, beach, and river mouth and bar deposits from 65 sites in the Northern California and Southern Oregon Coast were analysed for grain size properties. These samples were taken to provide source area information for a projected study of the offshore sediments of the Northern California Continental Shelf. The data are presented graphically as cumulative weight percent curves and histograms with respect to grain size. The statistical parameters median, sorting coefficient, skewness and kurtosis are calculated for each sample. (Woodard-USGS)
W72-14371

METHOD OF CONTROLLING EROSION ON SEASHORES,
For primary bibliographic entry see Field 04D.
W72-14464

A SEDIMENTOLOGIC STUDY OF MOBILE BAY, ALABAMA,
Florida State Univ., Tallahassee. Sedimentological Research Lab.
For primary bibliographic entry see Field 02L.
W72-14524

FACTORS AFFECTING SOLUTION RATE OF BIOGENIC OPAL IN SEAWATER,
Hawaii Univ. Honolulu., Dept. of Oceanography.
For primary bibliographic entry see Field 02K.
W72-14535

ENVIRONMENT PATTERN RECONSTRUCTION FROM SAMPLE DATA. II. SPATIAL CHARACTERISTICS--MISSISSIPPI DELTA REGION,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02L.
W72-14536

CHRONOLOGY OF THE BLACK SEA OVER THE LAST 25,000 YEARS,
Woods Hole Oceanographic Institution, Mass.
E. T. Degens, and D. A. Ross.
Chemical Geology, Vol 10, No 1, p 1-16, September 1972. 12 fig, 2 tab, 21 ref.

Descriptors: *Bottom sediments, *Water chemistry, *Paleohydrology, *Dissolved oxygen, *Salinity, Eutrophication, Sedimentation, Sedimentation rates, Stratification, Density stratification, Thermal stratification, Water circulation, Oceanography.
Identifiers: *Black Sea.

Deep-water sediments of the Black Sea deposited during Late Pleistocene and Holocene time are distinguished by three sedimentary units: (1) a microlaminated coccolith ooze mainly consisting of Emiliania huxleyi; (2) a sapropel; and (3) a banded lutite. The base of the first unit lies at 3,000 years B.P., that of the second at 7,000 years B.P., and that of the third at least at about 25,000 years B.P. Beginning with the base of the section dated at about 25,000 years B.P., the sea changed from anoxic marine to oxic freshwater conditions. By the time this stage ended, about 22,000 years B.P., the Black Sea had become a truly freshwater habitat. The lake phase lasted about 12,000 to 13,000 years. Sedimentation rates were in the order of 1 m/1,000 years, but began to decrease as sea level rose during the last 5,000 years of this phase (9,000-15,000 years B.P.). Starting at about 9,000 years B.P. and continuing to 7,000 years B.P., Mediterranean waters occasionally spilled over the Bosporus as a consequence of ice retreat and sea level rise. This marked the beginning of a gradual shift from freshwater to marine, and from well aerated to stagnant conditions. At about 7,000 years B.P. when deposition of unit 2 started, the H2S zone was well established. Sedimentation rates dropped to 10 cm/1,000 years. Environmental conditions similar to those of today finally became established around 3,000 years B.P. (Knapp-USGS)
W72-14732

MOLYBDENUM, ARSENIC, AND OTHER ELEMENTS IN STREAM SEDIMENTS, TOMAH MOUNTAIN, TOPSFIELD, MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14733

FOUR-DIMENSIONAL MODEL FOR BEACH AND INNER NEARSHORE SEDIMENTATION,
Western Michigan Univ., Kalamazoo.
R. A. Davis, Jr., and W. T. Fox.
Journal of Geology, Vol 80, No 4, p 484-493, July 1972. 6 fig, 13 ref.

Descriptors: *Sedimentation, *Beaches, *Mathematical models, *Terrain analysis, *Lake Michigan, Sediment transport, Sand bars, Waves (Water), Surf, Littoral drift, Surveys, Time series analysis, Dunes, Geomorphology.
Identifiers: *Beach sedimentation.

Temporal changes in beach and nearshore morphology may be slow and subtle or rapid and quite obvious. In order to measure and assess all of these changes, it is necessary to conduct detailed sequential topographic surveys. Such detailed and closely spaced data can be used to construct a framework for beach and nearshore sedimentation. This framework is constructed from a time sequence of topographic maps and from time-distance diagrams, thus providing a four-dimensional model called an area-time prism. The prism graphically depicts the dynamic nature of the beach and nearshore environment by showing the changes taking place in various key surfaces which are contoured to show their changes through time. These surfaces include the terrace cliff, shoreline, shallow sand bars, and the 4-foot depth contour. The area-time prism makes it possible to show various temporal relationships among these dynamic surfaces. By comparing this four-dimensional model with monitored environmental variables such as barometric pressure, wave height, and longshore current velocity, it is possible to demonstrate how beach and nearshore morphology responds to these variables through time. The result is a comprehensive process-response approach to the study of this dynamic environment; however, it is applicable to any modern sedimentary environment. (Knapp-USGS)
W72-14735

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 14,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-14746

GEOLOGY OF THE FALL ZONE IN DELAWARE,
Delaware Geological Survey, Newark.
N. Spoljaric.
Delaware Geological Survey Report of Investigations No. 19, March 1972. 30 p, 7 fig, 1 plate, 29 ref.

Descriptors: *Geology, *Geologic formations, *Physiographic provinces, *Delaware, *Geomorphology, Sedimentology, Waterfalls, Erosion, Alluvium, Sediment transport, Geologic time, Stratigraphy, Rocks.
Identifiers: *Fall zone (Delaware).

The complex geologic framework of the Fall Zone in Delaware is primarily caused by diverse structural features in the crystalline basement rocks that have exerted influence on the distribution of the overlying sediments of the Coastal Plain. A lateral fault and three different sets of vertical faults were recognized in the crystalline basement complex. The vertical faults have broken the surface of the basement complex into horst-graben structures. Although these faults were probably formed before the deposition of the Potomac Formation (Lower Cretaceous), there are indications that they are still active. The deposits of the Potomac Formation were brought into the area through the ancient Delaware River Valley and through the Piedmont. Fine sediments, clay and silt, are predominant. Sands are generally confined to the main distributary valleys. The areal distribution and thickness of the Potomac Formation were greatly influenced by the structures of the underlying crystalline basement complex. A considerable amount of these sediments was eroded from the area before the overlying Pleistocene deposits were laid down. (Woodard-USGS)
W72-14749

SCOUR AND FILL IN THE MISSOURI RIVER AS RELATED TO THE WATER RESOURCES PLANNING,
South Dakota State Univ., Brookings. Water Resources Inst.
Fred F. M. Chang, and Tsan-Wen Wang.
Available from the National Technical Information Service as PB-212 379, $3.00 in paper copy, $0.95 in microfiche. Completion Report, August 1972. 93 p, 18 fig, 7 tab, 25 ref, 4 append. OWRR B-008-SDAK (3).

Descriptors: *Mathematical model, *Scour, *Sedimentation, *Planning, Deposition, Rivers, Reservoir silting, Unsteady flow, *Model studies.
Identifiers: Method of Characteristics, *Missouri River.

Two mathematical models are applied to simulate sediment deposit in the Missouri River between the Oahe Dam and the Big Bend Dam. The models are based on three characteristic and two characteristic equations. The Engelund-Hansen and Einstein-Brown formulas were chosen as the working equations for sediment transport. The sediment deposit in the study reach was studied to acquire the computation procedures. The computer time used for the model based on three characteristic equations is more than that used for the model based on two characteristic equations and hence the latter model is employed to compute the sediment deposit for clear water and non-clear water releases from the Oahe Dam with discharges 1,020 CMS and 1,586 CMS in the thirty and sixty day time periods. The results obtained by using the Einstein-Brown formula with both clear water and non-clear water releases showed that only depositions in the reach had occurred. The results computed by using the Engelund-Hansen formula with clear water release showed scour in the reach between the Oahe Dam and the mouth of the Bad River, but showed deposit in the rest of the reach. This phenomenon was also noticed in the field observation.
W72-14844

A RANDOM-WALK SIMULATION MODEL OF ALLUVIAL-FAN DEPOSITION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02E.
W72-14915

GLACIOLOGICAL INVESTIGATIONS IN ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W72-14940

AN INTERPRETATION OF RESERVOIR SEDIMENTATION. II. CLAY MINERALOGY,
California Univ., Riverside.
L. J. Lund, H. Kohnke, and M. Pauler.
Journal of Environmental Quality, Vol 1, No 3, p 303-307, July-September 1972. 2 fig, 2 tab, 12 ref.

Descriptors: *Sedimentation, *Reservoir silting, *Sediment yield, *Clay minerals, Mineralogy, Soil properties, Illinois, Indiana, Silts, Clays, Soil erosion, Kaolinite, Bottom sediments, Lakes.

The effect of mineralogical composition of the watershed soils on the rate of sedimentation and the mineralogy of the sediments in reservoirs was studied in 13 watersheds in Indiana and Illinois which were similar in soil clay composition. There were only small differences between the composition of the soil clay of the watershed and that of the resulting sediment clay. The amounts of vermiculite, mica, kaolinite, and amorphous alumina in the sediment clays could be accounted for by the amounts in the soil clays. In most cases montmorillonite occurred in larger proportions in the sediment clays, while in case of quartz this relationship was reversed. The estimation of sedimentation rates from geomorphological data, including soil texture, could not be improved by adding mineralogical parameters. (Knapp-USGS)
W72-14944

THE ELECTROCHEMICAL CHARACTERISTICS OF NATURAL REDOX CELLS,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 02K.
W72-14957

SEDIMENTS AND WATERS OF SOMES SOUND, A FJORDLIKE ESTUARY IN MAINE,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 02L.
W72-14959

SEDIMENTATION AND EROSION ON HORIZON GUYOT,
Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
P. Lonsdale, W. R. Normark, and W. A. Newman.
Geological Society of America Bulletin, Vol 83, No 2, p 289-315, February 1972. 18 fig, 95 ref.

Descriptors: *Sedimentation, *Pacific Ocean, *Data collections, Sedimentation rates, Sediment transport, Scour, Erosion, Marine geology, Stratigraphy, Sedimentology.
Identifiers: *Seamounts.

A small part of the 2-km-deep summit of Horizon Guyot, a flat-topped submarine ridge at the eastern end of the Mid-Pacific Mountains, was surveyed in detail with a deeply towed instrument package. The summit cap of Tertiary nannoplankton ooze has truncated horizons, including Eocene chert layers, which crop out at its margins. Continuing erosion has winnowed away the fine components of the sediment, while bedload transport of the remaining foraminiferal sand creates regular trains of ripples and dunes. All three current meters recorded currents faster than 15 cm/sec within 12 m of the sea floor. Scouring and sediment redistribution is performed by locally accelerated tidal currents. Net movement of sand is upslope. Hardrock terraces underlying the pelagic sediment are exposed at the margins of the summit platform. They are probably deposits of high mobile hyaloclastite. (Knapp-USGS)
W72-14961

2K. Chemical Processes

GEOCHEMISTRY OF FERROMANGANESE OXIDE CONCRETIONS AND ASSOCIATED DEPOSITS IN LAKE ONTARIO,
Ottawa Univ. (Ontario). Dept. of Geology.
D. S. Cronan, and R. L. Thomas.
Geological Society of America Bulletin, Vol 83, No 5, p 1493-1501, May 1972. 5 fig, 2 tab, 23 ref.

Descriptors: *Lake Ontario, *Manganese, *Chemical precipitation, *Water chemistry, *Oxidation-reduction potential, Trace elements, Diffusion, Geochemistry, Sampling, Variability.
Identifiers: *Manganese nodules.

A large deposit of ferromanganese oxide coated sands and scattered manganese nodules occurs in the northern portion of Lake Ontario. Their Ni, Cu, and Co contents are lower than in deep-sea nodules, but higher than in most previously described lacustrine concretions. Pb and Zn are high in the coatings and exceed the concentrations found in many previously analyzed Mn deposits. Within the deposit, Mn, Ci, Co, and Zn contents are correlated, and they vary inversely with Fe. Mn, Fe, Ni, Cu, and Pb are present in the interstitial waters of the sediments underlying the deposit in higher concentrations than in the overlying lake waters, thus providing a potential source of metals for concretion formation. Eh increases from south to north across the deposit in such a way that iron may be selectively oxidized and precipitated in the south and manganese in the north. Upward diffusion of Mn, Fe, and associated elements from the underlying sediments probably provides the principal source of the metals in the south of the deposit, while metal-enriched bottom waters are probably the principal source in the north. (Knapp-USGS)
W72-14202

BERYLLIUM-7 AND FISSION PRODUCTS IN THE GEOSECS II WATER COLUMN AND APPLICATIONS OF THEIR OCEANIC DISTRIBUTIONS,
For primary bibliographic entry see Field 05B.
W72-14220

TRITIUM PROFILE AT THE ATLANTIC 1970 GEOSECS TEST CRUISE STATION,
Heidelberg Univ. (West Germany). Institut fuer Angewandte Physik.
For primary bibliographic entry see Field 05B.
W72-14221

BARIUM AND STRONTIUM CONCENTRATIONS IN PACIFIC AND MEDITERRANEAN SEA WATER PROFILES BY DIRECT ISOTOPE DILUTION MASS SPECTROMETRY,
Institut de Physique du Globe, Paris (France).
For primary bibliographic entry see Field 05A.
W72-14222

BARIUM AT GEOSECS III IN THE SOUTHWEST PACIFIC,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
M. P. Bacon, and J. M. Edmond.
Earth and Planetary Science Letters, Vol 16, No 1, p 66-74, September 1972. 4 fig, 5 tab, 20 ref.

Descriptors: *Trace elements, *Sea water, *Pacific Ocean, *Ocean currents, Profiles, Water chemistry, Water circulation, Diffusion, Distribution patterns, Oceanography, Data collections, Sampling, Water analysis.
Identifiers: *Barium.

A detailed, highly precise barium profile was measured at Geosecs III, off Tonga, in the southwest Pacific. There is a smooth increase in barium concentration from the surface values of 4.7 micrograms/kg to a deep maximum of 18.4 micrograms/kg at 2.974 km. Below this maximum there is an abrupt decrease to 14.3 micrograms/kg in the deep Western Boundary Current. Comparison with published data shows recent Pacific and Antarctica barium profiles to be consistent within 2%. Model calculations do not require any in situ injection of barium (or of silicate or alkalinity) in the water column; the form of the profile can be explained by vertical diffusion and advection between horizontally advecting water masses. A layer of more saline water, possibly derived from Ross Sea bottom water, or the North Atlantic deep water core in the Circumpolar Current, is present immediately above the deep Boundary Current. (Knapp-USGS)
W72-14223

STRONTIUM DISTRIBUTION IN SEA WATER PROFILES FROM THE GEOSECS I (PACIFIC) AND GEOSECS II (ATLANTIC) TEST STATIONS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W72-14224

SIGNIFICANCE OF SUPRATIDAL DOLOMITIZATION IN THE GEOLOGIC RECORD,
Pomona Coll., Claremont, Calif. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-14226

STUDY OF PH AND EH CHANGES OF WATER-LOGGED SOIL AND IN PURE SYSTEMS,
National Commission on Agriculture, New Delhi (India).
For primary bibliographic entry see Field 02G.
W72-14269

MECHANISM OF THE FORMATION OF EXCHANGEABLE AMMONIUM NITROGEN IMMEDIATELY AFTER WATERLOGGING OF RICE SOILS,
Palli Siksha Sadana, Sriniketan (India).
For primary bibliographic entry see Field 02G.
W72-14287

USE OF FIBER OPTICS IN THE STUDY OF CHEMILUMINESCENT REACTIONS,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
For primary bibliographic entry see Field 05A.
W72-14344

A HIGH PRESSURE OPTICAL CELL FOR STUDY OF BIOCHEMICAL SOLUTIONS,
Columbia Univ., New York. Dept. of Mechanical Engineering.
T. Papanek, and T. L. Fabry.
The Review of Scientific Instruments, Vol 43, No 5, p 738-739, May 1972. 1 fig, 4 ref.

Descriptors: *Spectroscopy, *Biochemistry, Instrumentation, Measurement, Spectrophotometry.
Identifiers: Optical cells, Biochemical solutions, Myoglobin, Biological samples.

The construction and use of an optical cell is described for spectrographic studies of biochemical solutions under pressures up to 4080 atm and data from studies of myoglobin are presented. The optical cell described incorporates the following design features: It is a monoblock configuration comprising both a pressure intensifier and an optical portion; the sample contacts only glass and

paraffin; the cell interfaces easily with spectrophotometric equipment commonly used in biochemistry; it is relatively easy to operate and survives repeated use; it is constructed of Almar 18-250 maraging steel, a material not previously used for this application. (Mortland-Battelle)
W72-14345

SILICON, RADIUM, THORIUM, AND LEAD IN SEAWATER: IN-SITU EXTRACTION BY SYNTHETIC FIBRE,
Tata Inst. of Fundamental Research, Bombay (India).
S. Krishnaswami.
Earth and Planetary Science Letters, Vol 16, No 1, p 84-90, September 1972. 1 fig, 3 tab, 24 ref.

Descriptors: *Water analysis, *Sea water, *Sampling, *Trace elements, *Adsorption, Silica, Radium radioisotopes, Lead, Analytical techniques, Equipment, Radioisotopes, Stable isotopes, Oceanography.
Identifiers: *Thorium.

Acrilan fibre loaded with ferric hydroxide may be used to concentrate Si and trace elements from sea water. This synthetic fibre is cheap, relatively blank free and easily processed. Activity ratios of Ra-228 and Ra-226 were measured by this technique in the Indian Ocean and the Mediterranean; the results are consistent with those made directly on seawater. Data on fibre enrichment factors to seawater for Si, Ra, Th, and Pb are listed; these factors range from 200 to 10,000. (Knapp-USGS)
W72-14353

GEOSECS II, THE 1970 NORTH ATLANTIC STATION: HYDROGRAPHIC FEATURES, OXYGEN, AND NUTRIENTS,
Woods Hole Oceanographic Institution, Mass.
D. W. Spencer.
Earth and Planetary Science Letters, Vol 16, No 1, p 91-102, September 1972.

Descriptors: *Sea water, *Water chemistry, *Salinity, *Nutrients, *Dissolved oxygen, Oceanography, *Atlantic Ocean, Sampling, Water analysis, Mixing, Tracers, Temperature, Water circulation, Strontium, Silica, Nitrates, Phosphates, Carbon dioxide, Radium radioisotopes.

Profiles of salinity, temperature, oxygen and nutrients for a station at 35 deg 46.5 min N and 67 deg 59.8 min W show the influence of the five major sources of deep water in the North Atlantic Ocean. The presence of distinct, identifiable cores of water types, far removed from their sources, together with linear relationships between salinity and both oxygen and silicate in the deep water suggest that horizontal mixing processes predominate over vertical dissipation and in situ production or loss processes in determining the distribution of these tracers in the deep western Atlantic Ocean. (Knapp-USGS)
W72-14354

TOTAL CO2, C-13, AND DISSOLVED OXYGEN -0-18 AT GEOSECS II IN THE NORTH ATLANTIC,
Scripps Institution of Oceanography, La Jolla, Calif.
P. Kroopnick, R. F. Weiss, and H. Craig.
Earth and Planetary Science Letters, Vol 16, No 1, p 103-110, September 1972. 1 fig, 3 tab, 24 ref.

Descriptors: *Water chemistry, *Atlantic Ocean, *Carbon dioxide, *Carbon radioisotopes, *Dissolved oxygen, Stable isotopes, Oxygen isotopes, Sampling, Profiles, Oceanography, Water analysis.

This paper presents profiles of total CO2, C-13 in CO2, dissolved O2, and 0-18 in dissolved O2, measured at Geosecs II in the North Atlantic. The O2 minimum at 1000 m in accompanied by a minimum in C-13 and a sharp maximum in 0-18; CO2 increases downward through this layer. All four parameters are remarkably uniform in the deep and bottom water below the O2 minimum. In contrast to the North Atlantic, there is a very large gradient of dissolved O2 in the vertical profile of North Pacific Deep Water; however, if the mean deep-water O2 concentration is compared with the uniform value in North Atlantic Deep Water, the O2 and CO2 differences in North Atlantic and North Pacific Deep Water are essentially equimolar at 160 micromoles/kg. If 77% of deep-water O2 consumption is used for oxidation or organic carbon, the increase of CO2 in Pacific deep water is about 25% due to dissolution of carbonate, and 75% due to oxidation of organic matter, in the vertical particulate flux. These proportions are in agreement with those estimated from alkalinity - CO2 variations. (Knapp-USGS)
W72-14355

SHIPBOARD ANALYSIS OF STRONTIUM-90 IN SEAWATER ON GEOSECS II,
For primary bibliographic entry see Field 05A.
W72-14356

ANOMALOUS WATER AND OTHER POLYMERIC MATERIALS,
Maryland Univ., College Park. Center of Materials Research.
For primary bibliographic entry see Field 01B.
W72-14365

WATER PHENOMENA PHASE II: THEORETICAL STUDY OF WATER CLUSTERS AND A SEARCH FOR A NEW ALLOTROPE OF LIQUID WATER,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
For primary bibliographic entry see Field 01B.
W72-14366

COMPOSITION OF FLUID INCLUSIONS,
Geological Survey, Washington, D.C. Geologic Div.
E. Roedder.
Geological Survey Professional Paper 440-JJ (Chapter JJ), 1972. 164 p, 4 fig, 12 plate, 8 tab, 1,606 ref.

Descriptors: *Geochemistry, *Chemical properties, *Rocks, Mineralogy, *Liquids, Water chemistry, Water types, Gases, Reviews, Data collections, Chemical analysis, Geology, Chemical reactions, Analytical techniques.
Identifiers: Fluid inclusions (rock and minerals), Composition, Liquid phases.

Fluid inclusions in minerals and rocks preserve tiny samples of the fluids that have been present during a number of geological processes, including ore deposition. Although the original material trapped in them was generally a homogeneous fluid at the time of trapping most inclusions have undergone changes on cooling to surface temperatures, resulting in the formation of new phases such as a gas bubble, immiscible liquids, or daughter minerals. This report is mainly a compilation of the world literature on the methods and results of study of their composition, but it also includes various unpublished data. Although inclusions of organic liquids and gases are common in some localities, most fluid inclusions consist of a liquid water solution. At room temperature, the gas bubble usually contains only water vapor at 0.03 atmosphere pressure, but it may consist of carbon dioxide at pressures up to 70 atmospheres. (Woodard-USGS)
W72-14519

HYDROLOGIC RECONNAISSANCE OF THE PROMONTORY MOUNTAINS AREA, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14526

RADIUM--228 PROFILE AT THE SECOND GEOSECS INTERCALIBRATION STATION, 1970, IN THE NORTH ATLANTIC,
Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory.
R. M. Trier, W. S. Broecker, and H. W. Feely.
Earth and Planetary Science Letters, Vol 16, No 1, p 141-145, September 1972. 1 fig, 3 tab, 7 ref.

Descriptors: *Radium radioisotopes, *Atlantic Ocean, *Trace elements, *Tracers, Sampling, *Water analysis, Oceanography, Data collections, *Tritium, Thermocline, Water circulation, Diffusion, Mixing, Salinity, Ocean currents.

Ra-228 concentrations were measured in 12 subsurface water samples collected during August-September 1970 in the North Atlantic at the Second Geosecs Intercalibration Station. Ra-228 concentrations ranged from 1.5 to 2.1 dpm/100 kg in the water layer between 100 and 600 m depth, above the main thermocline, but decreased with increasing depth to less than 0.5 dpm/100 kg at 1.5 km, below the main thermocline. The two deepest samples, collected below 5 km depth, indicated that the Ra-228 concentration increased again to at least 1.2 dpm 100 kg as the interface with the sea floor sediments was approached. Above the 4 km level, the Ra-228 profile was roughly similar to the tritium profile. (Knapp-USGS)
W72-14532

TRACE ELEMENT PROFILES FROM THE GEOSECS-II TEST STATION IN THE SARGASSO SEA,
Woods Hole Oceanographic Institution, Mass.
P. G. Brewer, D. W. Spencer, and D. E. Robertson.
Earth and Planetary Science Letters, Vol 16, No 1, p 111-116, September 1972. 4 fig, 1 tab, 11 ref.

Descriptors: *Water chemistry, *Tracers, *Sea water, *Atlantic Ocean, *Water circulation, Ocean currents, Provenance, Oceanography, Sampling, Profiles, Data collections, *Trace elements, Distribution patterns.

During the GEOSECS-II test cruise a profile of 25 large-volume water samples were collected, filtered and stored in the acidified condition. Two laboratories have together determined Fe, Cu, Zn, Co, Sb, Cs and U in these samples. Both laboratories determined Zn and the correlation is good; Zn, Fe and Cu show a maximum in the North Atlantic Deep Water, Cs and U are essentially conservative and Sb show variability within the uncertainty of the technique. Sc is more abundant in deep water than surface water in both the Atlantic and Pacific Oceans. An intensely layered water column exists and all five sources of deep North Atlantic water can be identified in the profile. The profiles of zinc, iron and copper are clearly related to the cores of deep water. The Antarctic Bottom Water with a core at about 4800-4950 m is characterized by relatively uniform zinc and copper concentrations of 2.4 micrograms/kg and 0.6 micrograms/kg respectively. Dissolved iron appears to show a maximum at this same depth. The pronounced peak in the zinc profile at 1000 m is coincident with the oxygen minimum and maxima in the nutrient profiles. Some trace elements have distributions that are clearly related to the water mass structure and hence, their determination should provide important information to the Geosecs program. (Knapp-USGS)
W72-14533

EXCESS HE-3 IN THE ATLANTIC OCEAN,
McMaster Univ., Hamilton (Ontario). Dept. of Physics.
W. J. Jenkins, M. A. Beg, W. B. Clarke, P. I. Wangersky, and H. Craig.
Earth and Planetary Science Letters, Vol 16, No 1, p 122-126, September 1972. 2 fig, 2 tab, 14 ref.

Descriptors: *Sea water, *Helium, *Atlantic Ocean, *Water chemistry, Radiochemistry, Geochemistry, Oceanography, Water analysis, Data collections, Sampling, Trace elements, Tritium.

Measurements of helium isotopic ratios at two stations in the Atlantic show that the deep water contains far less excess He-3 than previous measurements have shown for the Pacific Ocean. The anomaly relative to atmospheric He is approximately 5% for the deep Atlantic compared to about 20% for the deep Pacific. The North Atlantic He-3 profile shows much more structure than the South Atlantic profile, with maxima observed at 500 m, 1900 m, and 3200 m. The maxima at 500 m and 1900 m are probably due to in situ tritium decay, whereas the 3200 m maximum cannot be due to tritium, and is probably due to leakage of He-3 into the Atlantic water from the mantle. Maxima in the trace elements Cu, Zn and Fe are also observed at 3200 m at this station. (Knapp-USGS)
W72-14534

FACTORS AFFECTING SOLUTION RATE OF BIOGENIC OPAL IN SEAWATER,
Hawaii Univ. Honolulu., Dept. of Oceanography.
D. C. Hurd.
Earth and Planetary Science Letters, Vol 15, No 4, p 411-417, August 1972. 3 fig, 2 tab, 25 ref.

Descriptors: *Solubility, *Silica, *Sedimentation, Plankton, Aquatic microorganisms, Sedimentation rates, Sedimentology, Deposition (Sediments).
Identifiers: *Biogenic opal.

The rate of solution of a single particle of biogenic opal is a function of solution temperature, degree of saturation, available surface area, and any coating or protective layer the test may have. Disturbance by grazing may have both adverse and beneficial effects on test preservation. Solution of opal within the first few tens of centimeters of the sediment is rapid, but below 1000 m water depth where temperature and dissolved silicate changes are small, the relative solution rates for the world's oceans should be within 10 to 12% of one another. While solution rates are highest in oceanic surface waters, significant amounts of solution occur at all depths. (Knapp-USGS)
W72-14535

QUALITY OF SURFACE WATER IN THE BEAR RIVER BASIN, UTAH, WYOMING, AND IDAHO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14539

THE ANALYSIS OF AROMATIC COMPOUNDS IN WATER USING FLUORESCENCE AND PHOSPHORESCENCE,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 05A.
W72-14541

WATER QUALITY PROBLEM IN EASTERN OSAKA, JAPAN,
Osaka City Univ. (Japan).
For primary bibliographic entry see Field 02F.
W72-14606

A SEDIMENTOLOGIC STUDY OF PERDIDO BAY AND ADJACENT OFFSHORE ENVIRONMENTS,
Florida State Univ., Tallahassee. Sedimentological Research Lab.
For primary bibliographic entry see Field 02L.
W72-14615

MOLYBDENUM, ARSENIC, AND OTHER ELEMENTS IN STREAM SEDIMENTS, TOMAH MOUNTAIN, TOPSFIELD, MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14733

BEHAVIOR OF BERYLLIUM SULFATE IN HARD AND SOFT WATER,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 05B.
W72-14744

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 14,
Woods Hole Oceanographic Institution, Mass.
L. S. Waterman, F. L. Sayles, and F. T. Manheim.
In: Initial Reports of the Deep Sea Drilling Project, Vol 14, p 753-762, 1972. 1 fig, 2 tab, 1 ref.

Descriptors: *Water chemistry, *Sediments, *Atlantic Ocean, *Chemical analysis, Sampling, Cores, Sedimentology, Data collections, Water analysis, Soil types, Inorganic compounds.
Identifiers: *Sediment waters.

The interstitial waters from the sediments cored from the Atlantic Ocean on Leg 14 (Woods Hole Oceanographic Institution) exhibited characteristic compositional trends with three important exceptions. At most of the sites, the changes in Na and Cl are very small while enrichment of Ca and Sr and depletion of Mg and SO4 was typical of patterns observed in similar types of sediment recovered on previous legs. At Sites 139 and 140, off the African coast, and Site 144, off the coast of South America, systematic increases in concentration with depth were found for Na and Cl. At these sites, the concentration changes in Ca, Mg, SO4 and Sr generally followed diagenic patterns observed previously, but there is some indication of other factors affecting Mg concentrations. All analyses reported, with the exception of bulk water content and pH, were made on water samples which were squeezed from the sediments on board ship and preserved by heat-sealing in lengths of polyethylene tubing. The most striking feature of Sites 130, 140, and 144 was the increase in Na and Cl with depth. Chlorinities increased to values of 44, 32, and 2.8% respectively. Corresponding increases in Na concentrations occurred at all three sites. (Woodard-USGS)
W72-14746

NITRATE LEACHING UNDER BARE FALLOW AT A SITE IN NORTHERN NIGERIA,
Reading Univ. (England). Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W72-14942

STABLE ISOTOPE SURVEY OF THE FRESH WATER OCCURRENCES IN ISRAEL AND THE NORTHERN JORDAN RIFT VALLEY,
Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept.
J. R. Gat, and W. Dansgaard.
Journal of Hydrology, Vol 16, No 3, p 177-211, July 1972. 15 fig, 9 tab, 16 ref.

Descriptors: *Stable isotopes, *Water balance, *Water chemistry, Precipitation (Atmospheric), Water sources, Hydrologic budget, Hydrologic cycle, Evapotranspiration, Tracers, Hydrogeology, Groundwater, Surface waters.
Identifiers: *Jordan Valley (Israel).

The stable isotope composition (Oxygen-18 and Deuterium) of the meteoric water cycle in Israel was surveyed. The survey comprised space and time variations of isotopic abundance in precipitation, surface and groundwater sources. Both the effect of the geomorphology on cloud evolution and the effect of secondary evaporation from falling droplets affect the isotope composition of precipitation. In mountainous aquifers, the isotope composition matches that of precipitation on the recharge areas. In the coastal plain and the inland valleys heavy isotopic species are enriched in groundwaters relative to local precipitation. The degree of aridity in different regions in the country is reflected in the isotopic composition. Isotope data were used to assess the hydrographical structure of the combined Jordan flow and the role of water loss by evaporation in the system's water balance. The isotope composition of the surface waters of the Dead Sea is also given. (Knapp-USGS)
W72-14945

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA, PART III, INFLUENCE OF BOUNDARY CONDITIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02F.
W72-14949

THE ELECTROCHEMICAL CHARACTERISTICS OF NATURAL REDOX CELLS,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
M. Whitfield.
Limnology and Oceanography, Vol 17, No 3, p 383-393, May 1972. 7 fig, 2 tab, 18 ref.

Descriptors: *Oxidation-reduction potential, *Sediments, *Instrumentation, *Calibrations, *Water chemistry, Electrochemistry, Electrical properties, Electrodes, Chemical potential, Iron, Manganese.
Identifiers: *Redox cells (Natural).

The electrical characteristics of a range of natural redox cells were measured. The equilibrium exchange current densities (i) were calculated and compared with the current drains imposed by modern electrometers. Instrumental loading is negligible, but the small values of i observed may result in the slow attainment of a steady-state potential. This effect may not be so serious in reduced sediments where the Eh is closely correlated with sulfide activity. In other cases some of the irregularities in electrode behavior may be removed by discharging the cell in situ and measuring its recharge characteristics. (Knapp-USGS)
W72-14957

SEDIMENTS AND WATERS OF SOMES SOUND, A FJORDLIKE ESTUARY IN MAINE,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 02L.
W72-14959

AN ANALYSIS OF THE CONCENTRATIONS OF HEAVY METALS IN MONTEREY HARBOR UTILIZING THE METHODS OF ATOMIC ABSORPTION SPECTROPHOTOMETRY AND POLAROGRAPHY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W72-14964

USE OF X-RAY FLUORESCENCE TO DETERMINE TRACE METALS IN WATER RESOURCES,
Dayton Univ., Ohio. Dept. of Physics.

For primary bibliographic entry see Field 05A.
W72-14965

2L. Estuaries

SALTWATER INTRUSION EXTRACTION BARRIER,
California State Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 02F.
W72-14204

DOG RIVER, MOBILE BAY, ALABAMA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14279

EVIDENCE FOR THE RECOVERY OF THE WATERS OFF THE EAST COAST OF NOVA SCOTIA FROM THE EFFECTS OF A MAJOR OIL SPILL,
Bedord Inst., Dartmouth (Nova Scotia). Atlantic Oceanography Lab.
For primary bibliographic entry see Field 05C.
W72-14292

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES. A SURVEY OF THE LEAD CONTENT OF FISH FROM 49 NEW YORK STATE WATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
For primary bibliographic entry see Field 05C.
W72-14298

PRODUCTIVITY OF THE BENTHIC MICROFLORA OF SHOAL ESTUARINE ENVIRONMENTS IN SOUTHERN NEW ENGLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W72-14317

EFFECTS OF THE OIL INDUSTRY ON SHORE LIFE IN ESTUARIES,
University Coll. of Swansea (Wales). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-14318

THE ECOLOGY OF MORECAMBE BAY. II. INTERTIDAL INVERTEBRATES AND FACTORS AFFECTING THEIR DISTRIBUTION,
Nature Conservancy, Norwich (England). Coastal Ecology Research Station.
For primary bibliographic entry see Field 05C.
W72-14338

THE ECOLOGY OF MORECAMBE BAY. IV. INVERTEBRATE DRIFT INTO AND FROM THE RIVER LEVEN,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W72-14339

SEDIMENTS OF THE CONTINENTAL MARGIN OFF THE EASTERN UNITED STATES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-14350

HYDROLOGY OF WESTERN COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W72-14359

RESULTS OF HYDRAULIC AND SHOALING STUDIES IN MARCUS HOOK-SCHUYLKILL REACH OF DELAWARE RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14370

EFFECTS OF A PROPOSED 35-FOOT CHANNEL TO RICHMOND ON CURRENTS AND SALINITIES OVER THE SEED OYSTER BEDS IN JAMES RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05C.
W72-14376

RELATIONS OF FRESH AND SALTY GROUND WATER ALONG THE SOUTHEASTERN U.S. ATLANTIC COAST,
Geological Survey, Brunswick, Ga.
R. L. Wait, and J. T. Callahan.
Ground Water, Vol 3, No 4, p 3-17, October, 1965. 14 fig, 50 ref.

Descriptors: *Saline water - freshwater interfaces, *Saline water intrusion, Barrier islands, *Atlantic coastal plain, Permeability, *Southeast U.S..
Identifiers: *Piezometric surface, *Chloride concentrations, Total dissolved solids.

Studies of the hydrogeologic environments and the dynamic and equilibrium relations of fresh and salt water in aquifers have been intensified at several places along the southeastern Atlantic Coast. Some salt-water problems involve the coastal water-table aquifer, and others involve parts of the artesian system. On the sandy coastal islands of North Carolina, fresh-water lenses under water-table conditions float on salt water. In the Savannah, Georgia, and South Carolina area, salt-water encroachment along two of five water-bearing zones in the principal artesian (limestone) aquifer has been caused by the decline of artesian pressure due to pumping. Along the southeast Florida coast drainage canals have been the primary cause of salt-water contamination of the highly permeable Biscayne aquifer. (Campbell-NWWA)
W72-14518

A SEDIMENTOLOGIC STUDY OF MOBILE BAY, ALABAMA,
Florida State Univ., Tallahassee. Sedimentological Research Lab.
J. J. Ryan.
Available from NTIS, Springfield, Va, 22151 as COM 72-10295. Price $3.00 paper copy; $0.95 microfiche. Florida State University Sedimentological Research Laboratory Contribution No 30, June 1969. 110 p, 17 fig, 12 tab, 54 ref.

Descriptors: *Estuaries, *Sedimentology, *Currents (Water), Sediments, *Alabama, Bays, Quartz, Clay minerals, Tidal effects, Geomorphology, Bathymetry, Shoals, Reefs, Sand bars, Bed load.
Identifiers: *Mobile Bay (Ala).

Mobile Bay, a 392 sq mi estuary on the northeast Gulf of Mexico, is the terminus of the fourth largest river system in terms of discharge in the United States. The estuary is 31 mi long and ranges in width from 8-10 mi in the northern part to 24 mi in its lower reaches. Circulation patterns are controlled primarily by river discharge, tides and bay geometry; important short term variations are due to meteorological tides. The estuary is highly stratified, moderately stratified, or, with exclusion of the ship channel, vertically homogeneous on the basis of its circulation pattern, depending on season and/or the year. Dominant terrigenous clastics are quartz, kaolinite, and montmorillonite. Comparisons of bathymetries of 1847-51 and 1960-62 indicate an average shoaling rate of 1.7 ft per century. Distribution and ages of buried oyster reefs indicate progressive downbay migration in response to progradation of the bay-head delta and changing circulation patterns in the estuary over the past five thousand years. (Lang-USGS)
W72-14524

REMOTE SENSING OF SEA SURFACE TEMPERATURE FROM EARTH SATELLITES,
Natioanl Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 07B.
W72-14531

ENVIRONMENT PATTERN RECONSTRUCTION FROM SAMPLE DATA. II. SPATIAL CHARACTERISTICS--MISSISSIPPI DELTA REGION,
Illinois Univ., Chicago. Dept. of Geological Sciences.
R. B. McCammon.
Available from NTIS, Springfield, Va 22151 as AD-740 336; Price $3.00 paper copy; $0.95 microfiche. Technical Report No 2, March 1972. 14 p, 16 fig, 6 tab, 5 ref. ONR N00014-69-A-0090.

Descriptors: *Sedimentology, *Deposition (Sediments), *Spatial distribution, *Deltas, *Louisiana, Mississippi River basin, Sampling, Optimization, Numerical analysis, Environment, Swamps, Marshes, Beaches, Bays, Lakes, Sand bars, Data collections.
Identifiers: *Depositional environments, Spatial structure, Natural levee.

The spatial structure of the map pattern for the Mississippi Delta region of southeast Louisiana can be represented by the mean distances which separate the seven major types of depositional environments. This information provides a basis for devising an optimal sampling strategy which takes into consideration the costs of sampling. For areas where it is desired to reconstruct the underlying depositional pattern based on the fewest numbers of samples, such a strategy could yield the greatest economic savings. Random sampling of the environmental map pattern of the Mississippi Delta region is nearly as effective as that obtained by systematic sampling. Any significant reduction in the sample size necessary for reconstructing the underlying pattern based on sampling requires that information on the spatial structure be obtained. As a first approximation, the distance between nearest boundary points for the seven major types of depositional environments in the Mississippi Delta region can be described by a family of gamma distributions. An optimal sampling strategy is proposed whereby the probability for intersecting environmental boundaries between successive samples is maximized whereas the probability of remaining within a boundary between successive samples is minimized. (Woodard-USGS)
W72-14536

FIELD AND LABORATORY STUDIES-NAVIGATION CHANNELS OF THE COLUMBIA RIVER ESTUARY,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 08B.
W72-14537

PERICO ISLAND PERMIT APPLICATION, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 06G.
W72-14564

DETERMINATION OF THE RELATION BETWEEN GROUNDWATER LEVEL, PRECIPITATION AND OVERDRAFT,
Aegean Univ., Bornova (Turkey).

For primary bibliographic entry see Field 02F.
W72-14601

A SEDIMENTOLOGIC STUDY OF PERDIDO BAY AND ADJACENT OFFSHORE ENVIRONMENTS,
Florida State Univ., Tallahassee. Sedimentological Research Lab.
N. M. Parker.
Available from NTIS, Springfield, Va. 22151, as Com-72-10286, Price $3.00 paper copy; $0.95 microfiche. M. Sc. Thesis, January 1968. 57 p, 13 fig, 7 tab, 34 ref. (NOAA report NOAA-72021125).

Descriptors: *Sedimentology, *Estuaries, *Bottom sediments, *Alabama, *Florida, Mineralogy, Sediments, Clay minerals, Sampling, Analytical techniques, Data collections, Benthos, Sedimentary petrology.
Identifiers: *Perdido Bay (Ala.-Fla. Coast).

The distribution of textural and mineralogical properties of bottom sediments from Perdido Bay and the adjacent continental shelf along the Alabama-Florida coast are analyzed using non-linear multiple regression. Both the offshore and the Perdido Bay estuary and back barrier bay complex are characterized by terrigenous clastics. The deeper water bottoms of the estuary system are composed predominantly of silt and clay with kaolinite, montmorillonite mixed-layer montmorillonite-illite and traces of illite comprising the clay mineralogy. Montmorillonite/kaolinite ratios are highest near the center of Perdido Bay. Quartz sand forms the nearshore region of the bays. Offshore, the average silt and clay content comprises less than one percent of the sediment and quartz sand dominates. (Woodard-USGS)
W72-14615

EFFECTS OF REMOVAL OF SHOOTERS ISLAND AND SHORE MODIFICATIONS ON TIDES, CURRENTS, AND SHOALING IN THE KILL CHANNELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14617

DISPERSION OF POLLUTANTS IN THE COASTAL WATERS OF THE SOUTHEASTERN UNITED STATES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05B.
W72-14651

WATER POLLUTION BY SEWAGE FROM WATER CRAFT,
Washington, Univ., Seattle. Coll. of Engineering.
For primary bibliographic entry see Field 05B.
W72-14663

RESOURCES, ENVIRONMENTAL PROBLEMS AND TECHNOLOGICAL SOLUTIONS IN CHESAPEAKE BAY,
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 05C.
W72-14664

WATER POLLUTION BY OIL. THE PROBLEM OF PERSISTENT CHEMICALS PRESENT IN THE ENVIRONMENT, (VERUNREINIGUNG DER GEWASSER DURCH OL. ZUM PROBLEM DER PERSISTENTEN CHEMIKALIEN IN DER UMWELT),
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-14670

EFFECTS OF MIREX ON SELECTED ESTUARINE ORGANISMS,
Environmental Protection Agency, Gulf Breeze, Fla.
For primary bibliographic entry see Field 05C.
W72-14710

GRAYS HARBOR ESTUARY, WASHINGTON, REPORT 1, VERIFICATION AND BASE TESTS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14727

CHRONOLOGY OF THE BLACK SEA OVER THE LAST 25,000 YEARS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-14732

EFFECTS OF ARTHUR KILL-KILL VAN KULL CHANNEL DEEPENING ON TIDES, CURRENTS AND SHOALING: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14740

COMPARATIVE CHARACTERIZATION OF THE GROWTH OF GOBIIDAE AND THE LEE PHENOMENON, (IN RUSSIAN),
Akademiya Nauk USSR, Kiev. Insytytu Hidrobiologii.
V. P. Bil'ko.
Vopr Ikhtiol. Vol 11, No 4, p 650-663. 1971. Illus.
Identifiers: *Fish physiology, *Growth rates, *Gobiidae, Gobius batrachocephalus, Gobius fluviatilis, Gobius melanostomus, Gobius syrman, Lee phenomenon, Estuaries, *Dnepr-Buh estuary.

Comparative studies were conducted in 1962-1963 in the Dnepr-Buh estuary on the growth of Gobiidae (Gobius melanostomus, G. fluviatilis, G. batrachocephalus, and G. syrman) and the Lee phenomenon. Evaluation of the rate of growth of the males and females showed that males with a smaller weight gain during the first yr of life had a compensatory gain during the second yr in comparison with fish that had a higher rate of growth during the first yr. In females the absolute rate of growth during the second yr of life decreases, but in relative terms increases somewhat. Thus, the Lee phenomenon appears to be a natural result of phylogenesis, ontogenesis, and the effects of environmental factors.--Copyright 1972, Biological Abstracts, Inc.
W72-14771

TOXICITY OF KRAFT MILL EFFLUENT TO SELECTED ESTUARINE ORGANISMS FROM YAQUINA BAY, OREGON,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 05C.
W72-14792

FLUORIDE CHLORINITY RATIOS IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
G. R. Miller, Jr., K. Woosley, and D. R. Kester.
Available from the National Technical Information Service as AD-740 861, $3.00 in paper copy, $0.95 in microfiche. Office of Naval Research Reference No. 72-1, February 1972. 16 p, 5 fig, 17 ref. ONR N00014-68-A-0215-003.

Descriptors: *Bays, *Fluorides, *Chlorides, Domestic water, Tracers, Estuaries, Freshwater, Sea water, Salinity, Water pollution sources, Fluoridation, Distribution.
Identifiers: *Narragansett Bay (RI), Providence River (RI).

The occurrence of fluoride in Narragansett Bay was examined to test its usefulness as a chemical tracer in this estuarine environment. Fluoride and chlorinity measurements were made at 12 stations in Narragansett Bay. The fluoride concentration was expressed as mg F/kg of seawater so that the values and the fluoride-chlorinity ratios were independent of temperature. Typical estuarine flow is evident with water from Rhode Island Sound wedged beneath the lower salinity water of the Providence River. The low salinity contribution, and hence the greatest mixing effects, occur primarily in the upper six meters at these stations. One remarkable feature about the fluoride distribution is that even though the fresh water input reduces the salinity of the incoming seawater by 20%, the fluoride concentration varies by less than 2%. The fluoride content of the fresh water, therefore, is comparable to that of the seawater (approximately 1 mg/l) which is typical of fluoridated, rather than natural, fresh water. The observations of the fluoride-chlorinity ratio in Narragansett Bay indicate that fluoride mixes conservatively along the main axis of the Bay. (Jones-Wisconsin)
W72-14813

EFFECTS OF CERTAIN PARAMETERS ON BACTERIAL POLLUTION AT A COASTAL SITE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-14817

PRIMARY PRODUCTION IN THE BAIE-DE-S-CHALEURS (SAINT-LAWRENCE GULF),
Station Zoologique, Villefranche-sur-Mer (France).
For primary bibliographic entry see Field 05C.
W72-14823

HYDROBIOLOGICAL EVALUATION OF THE SEPETIBA BAY,
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil). Div. of Zoology.
For primary bibliographic entry see Field 05C.
W72-14826

DYE DISPERSION PATTERNS FOR THREE OUTFALL LOCATIONS FOR THE WARWICK RIVER SEWAGE TREATMENT PLANT: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14951

SEDIMENTS AND WATERS OF SOMES SOUND, A FJORDLIKE ESTUARY IN MAINE,
Geological Survey, Woods Hole, Mass.
D. W. Folger, R. H. Meade, B. F. Jones, and R. L. Cory.
Limnology and Oceanography, Vol 17, No 3, p 394-402, May 1972. 8 fig, 2 tab, 14 ref.

Descriptors: *Bottom sediments, *Water chemistry, *Fjords, *Maine, Estuaries, Sedimentation, Water circulation, Currents (Water), Sediment transport, Sediment sorting, Suspended load, Particle size, Sedimentation, Salinity, Water temperature, Organic matter, Aquatic life, Dissolved oxygen.
Identifiers: *Somes Sound (Maine).

Bottom sediments in the Somes Sound estuary, Maine, coarsen progressively seaward from clay in the upper and middle parts through silt and sand

to gravel at the mouth. Most contain less than 5% CaCO3. Organic carbon and H2S are abundant in the clay of the upper sound. Epifauna, especially holothurians, cover most of the bottom near the mouth of the sound. Infauna predominate in the fine sediments of the middle and upper sound but are absent where H2S is high. Waters in the sound during August 1969 were well mixed and well oxygenated (6.7-4.7 ml/liter) from surface to bottom, despite the shallow sill that restricts water circulation at the narrow mouth. The net direction of flow of bottom water is landward, and the distributions of some sediment components show that bottom-water flow is counterclockwise. Particulate matter suspended in the water ranged from 0.6-4.1 mg/liter, with greatest concentrations in bottom waters above areas covered with fine-grained sediments. (Knapp-USGS)
W72-14959

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

METHOD AND APPARATUS FOR REMOVING DISSOLVED IMPURITIES FROM WATER,
G. S. Light.
U. S. Patent No. 3,565,767, 4 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1611, February 23, 1971.

Descriptors: *Patents, *Desalination, Potable water, *Heat exchangers, *Demineralization, Saline water, Evaporation, *Condensation, Water purification.
Identifiers: Scale formation.

A quantity of pressurized air is fed into a position of contact with an evaporating surface of a solution to provide air pressure acting on the surface. The solution is pressurized and heated without internal vapor formation. An increased solution temperature promotes increased evaporation or volatilization of the liquid into the air space above the evaporating surface. The evaporate is then fed into a condensation area and returned to its liquid form as demineralized water or purified water. (Sinha-OEIS)
W72-14467

METHOD FOR OPEN MULTICONDENSATION OF VAPORS FROM MULTIFLASH EVAPORATIONS,
D. F. Othmer.
U. S. Patent No. 3,567,591, 6 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 286, March 2, 1971.

Descriptors: *Patents, Evaporation, *Condensation, *Vaporization, Water purification, Water quality, Sea water, Saline water, Potable water, Equipment, Treatment, *Desalination, *Heat transfer, *Flash distillation.
Identifiers: *Multiflash evaporation.

A method is provided of condensing a series of vapor streams from multiflash evaporations of successively lower pressures by means of a series of sprays discharged by pumps to give a direct heat transfer surface of large surface area and very great heat transfer rates between vapor and liquid. Each pump lifts the cooling or condensing liquid, together with the condensate formed, through the range of pressure of one of the several stages. The condensation system may be used in conjunction with the vapor reheat system of multiflash evaporation. (Sinha-OEIS)
W72-14472

PROCESS FOR ELECTRICAL POWER GENERATION AND WATER PURIFICATION SYSTEM,
G. D. Doland.
U. S. Patent No. 3,567,952, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 356-357, March 2, 1971.

Descriptors: *Patents, *Distillation, *Electric power plants, Power plants, Water purification, Water quality, Treatment facilities, Equipment, Desalination, *Heat budget, *Steam.

This combined plant consists of a system for producing steam, at least one turbine prime mover for an electrical power generator, a system for heating power plant feedwater, a power plant exhaust steam condenser, a multistage distillation unit, and other equipment normally associated with water and power plant facilities. The systems are designed so that the power plant feedwater and steam do not mix with the water plant feed, product vapor or product water. Steam provides energy to the water plant as thermal energy is released. The thermal energy is used to preheat the water plant feed prior to entering the distillation unit. (Sinha-OEIS)
W72-14474

FISCAL YEAR 1973 AUTHORIZATION OF APPROPRIATIONS FOR THE FEDERAL SALINE WATER CONVERSION PROGRAM.
For primary bibliographic entry see Field 06E.
W72-14555

MULTICOMPONENT REVERSE OSMOSIS MEMBRANES,
Akron Univ., Ohio.
D. McIntyre, S. Krishnamurthy, and B. H. Meyer.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.00. Office of Saline Water Research and Development Progress Report No 766, May 1972. 247 p, 67 fig, 61 tab, 276 ref.

Descriptors: *Desalination, *Reverse Osmosis, *Membranes, *Synthesis, *Xray diffraction.
Identifiers: Triblock polymers, *Polymer synthesis, *Phase separation, *Cellulose acetate, *Solution properties, Polymer morphology, Acetylation, Hydroxylation, Bromination.

The possibility was studied of making reverse osmosis membranes by controlling the structure of polymeric membranes either by using a well defined two phase polymeric membrane or by attempting to control the structure of cellulose acetate. In the first phase of this study, small angle Xray scattering studies revealed the existence of regularly arranged phases in triblock polymer systems. In the second phase of study, acetylation, hydroxylation and bromination reactions were carried out on the triblock polymers in order to improve their reverse osmosis performance by increasing their hydrophilic character. Since cellulose acetate membranes were the most successful reverse osmosis membranes at the time this program was initiated thermodynamic, morphological, structural and solution studies were carried out to attempt to determine if cellulose acetate had a unique polymeric structure essential for effective desalination. (OSWabstract)
W72-14647

THE ECONOMICS AND USE OF LARGE SCALE ELECTRODIALYSIS PLANTS ON SELECTED TIDAL ESTUARIAL WATERS,
Stone and Webster Engineering Corp., Boston, Mass.
D. H. Guild.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.75. Office of Saline Water Research and Development Report No 777, December 1971. 280 p, 15 ref, 3 append.

Descriptors: *Desalination, *Water conservation, *Water supply, Water purification, Water treatment, *Electrodialysis, Optimization, *Systems analysis, *Waste water treatment.
Identifiers: *New York City Emergency Water Supply, *Wilmington (Del), Emergency water supply, Crodon Point, Indian Point, Hudson River.

The economics of providing potable water from treatment plants located on tidal estuaries was investigated. Treatment plants in the 25-300 MGD size range were assumed to be sited at specific locations on the estuaries on the Hudson and Delaware Rivers, for which hydrology data were available on salinity encroachment profiles in maximum drought years. A comprehensive computer optimization program was developed to determine the least cost of potable water supply from these specific plants and sites, balancing the dynamic elements of flow, temperature, seasonal salinity variation of the estuarial water against the cost of water treatment, sterilization, desalination and transport. The computer program may be applied to other river estuaries for which adequate hydrologic data on salinity characteristics are available. This methodology may be applied to determine the most economic location for a large-scale river water treatment plant to augment the water supply of a metropolitan area. Such location may or may not require the inclusion of desalination equipment in the plant complex, depending on the hydrology and cost of salinity hydrodynamics of the river estuary, the volume of potable water augmentation required and its cost of delivery to the point of distribution. (OSW abstract)
W72-14648

REVERSE OSMOSIS MEMBRANE MODULE, (SPIRAL-WOUND CONCEPT),
Gulf General Atomic Co., San Diego, Calif.
T. J. Larson, and B. C. Gibbons.
Available from the National Technical Information Service as PB-203 824, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 442, June 1969, 22 p, 4 fig, 1 tab, 2 ref. OSW 14-01-0001-1245.

Descriptors: *Reverse osmosis, *Membranes, *Brackish water, *Desalination plants.
Identifiers: *Spiral-wound module, Cellulose acetate.

Problems experienced with the spiral module were studied including comparison of glass head versus reinforced tricot backing materials, preventing leaks at the glue lines and reinforcing the membrane fold in the spiral to prevent leakage. The merits of Dacron cloth over glass beads as membrane support material and the proper use of a polypropylene reinforcing strip for the membrane fold are described. (See also W72-14069) (OSW abstract)
W72-14649

A METHOD OF DEMINERALIZATION USING STRONGLY ION EXCHANGE RESINS,
New Mexico State Univ., University Park. Engineering Experiment Station.
W. S. Midkiff.
Available from the National Technical Information Service as PB-212 272, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Completion Report, August 1972. 55 p, 25 fig, 12 ref. OWRR A-033-NMEX (1).

Descriptors: *Ion exchange, *Demineralization, *Water treatment, *Cation exchange, *Anion exchange, Water softening, Salt removal, Brackish waters, Resins.
Identifiers: Marginally Brackish waters, *Partial demineralization, *Ion exchange resins.

A new approach to demineralization of marginally brackish waters for individual domestic use is being proposed. The results of this investigation suggest that partial demineralization using a weak acid - weak base ion exchange system should offer simplicity and economy. In order to be satisfactory for domestic use, water need not be completely demineralized, however, in many cases it is desirable to provide more extensive treatment than hardness removal by sodium exchange. A system which will selectively remove multivalent anions and cations with a net reduction in total dissolved solids is needed. Regeneration characteristics must be favorable for the system to be economical. A system composed of a weakly acidic ion exchange column in hydrogen ion form and a weakly basic ion exchange column in hydroxide ion form will remove an increment of multivalent anions and cations and replace them with an equivalent amount of water. Additional increments of multivalent ions can be removed if desired by multiple units of weak acid and weak base ion exchangers in series. (Creel-New Mexico State)
W72-14679

ION-EXCHANGE SYSTEM BOASTS MORE PULLING POWER,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 05D.
W72-14816

WATER BROUGHT TO HIGHWAY REST AREA THE 'HARD' WAY.
For primary bibliographic entry see Field 04B.
W72-14886

PROPOSED DIABLO CANYON DESALTING PROJECT (DRAFT ENVIRONMENTAL STATEMENT).
Office of Saline Water, Washington, D.C.; and California State Dept. of Water Resources, Sacramento.

Available from the National Technical Information Service as PB-207 272-D, $3.00 in paper copy. March 2, 1972. 95 p, 11 fig, 5 tab, 29 ref, 1 append.

Descriptors: *California, *Environmental effects, *Desalination, *Desalination plants, Water sources, Water quality, Water supply, Sea water, Industrial water, Aquatic habitats, Breakwaters, Coastal structures, Effluents, Discharge (Water), Thermal water, Water demand, Water supply development, Municipal water, Desalination wastes, Water treatment.
Identifiers: *Environmental Impact Statements, *San Luis Obispo County (Calif).

The proposed project is the design, construction, and operation of a prototype seawater desalting plant and associated conveyance system. The plant, to be located in San Luis Obispo County, California, will be a multistage flash design with a capacity of approximately 40 million gallons per day. The immediate environmental impact of the project will be minor. High quality, desalted seawater will be used for municipal and industrial purposes in the service area in lieu of the State Water Project. The breakwater, intake and outfall structures will eliminate a small amount of natural marine habitat. However, the loss could be mitigated by proper design and construction of the breakwater. The intake of seawater will destroy an unknown amount of marine plankton, fish and food chain organisms. Proper intake location and design and limitation of flow velocity through the fish screens would minimize this loss. The discharge of effluent may destroy an unknown amount of marine resources due to dislodgement and possible thermal effects in the immediate outfall vicinity. The alternatives considered include no action, various alternative sites, water conveyance system alignment, and alternate effluent discharge systems. (Ellis-Florida)
W72-14925

MICROWAVE HEATING IN THE DESALINATION OF WATER,
S. J. Nesbitt, and E. M. Knapp.
U. S. Patent No. 3,577,322, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 96, May 4, 1971.

Descriptors: *Patents, *Desalination, *Vaporization, *Heat exchange, *Water purification, Freshwater, Potable water, Saline water, Brackish water, Water quality.
Identifiers: Microwave energy.

This method for the desalination and purification of water consists of indirect countercurrent heat exchange between cold saline water and the hot condensate leaving the system to preheat the saline water. The preheated saline water is exposed to microwave energy to further heat it to 213 deg F. It is then passed into indirect counter current heat exchange with superheated steam derived from a subsequent step to completely vaporize the saline water. Then by centrifuging, the vaporized saline water separates vapor from the salt. The separated vapor is heated by indirect heat exchange with liquid conveying waste heat from the source of microwave energy to provide the superheated steam. The superheated steam leaves the system as fresh water condensate. (Sinha-OEIS)
W72-14975

DISTILLATION APPARATUS WITH VACUUM CONTROLLED BY RATE OF DISTILLATE FLOW,
Weir (G. and J.) Ltd., Glasgow (Scotland). (assignee).
F. T. Randell.
U. S. Patent No. 3,577,320, 2 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 95, May 4, 1971.

Descriptors: *Patents, *Distillation, *Evaporation, *Condensation, Equipment, *Desalination, *Water quality, Water purification, Water treatment.

This apparatus comprises a casing housing an evaporation section and a condensing section including a vapor cooling device in open communication with the evaporation section. An air pump is used to create a sub-atmospheric pressure within the casing to permit the free flow of vapor between the sections. The rate of distillate outflow regulates the pressure within the casing which in turn maintains the rate of production of vapor in the evaporation section. (Sinha-OEIS)
W72-14976

MULTIEFFECT DISTILLATION PROCESS AND SYSTEM WITH DOWNWARD REMOVAL OF VAPOR,
Aluminum Co. of America, Pittsburgh, Pa. (assignee).
M. H. Brown.
U. S. Patent No 3,575,817, 7 p, 11 fig, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 588, April 20, 1971.

Descriptors: *Patents, *Distillation, *Desalination, Sea water, Brackish water, Saline water, Evaporation, Condensation, Potable water, *Heat transfer.

The liquid is passed through successive evaporation zones each situated beneath its preceding zone. A portion of the liquid passing through each zone is evaporated to produce a vapor and leave an unevaporated liquid portion at a reduced temperature. The relative pressures in successive zones are maintained at steadily decreasing levels to effect steadily decreasing pressure and temperature gradients proceeding downward through the successive zones. The vapor formed in each zone is moved along and is in heat transfer relation with the unevaporated liquid. Heat exchange causes condensation from the vapor on the inside of the chamber together with some heating and evaporation of the liquid on the outside of the chambers. (Sinha-OEIS)
W72-14985

COUNTERFLOW, MOVING BED TYPE, ION EXCHANGE APPARATUS,
Nippon Rensui Kabushiki Kaisha (Japan).
M. Hirowatari, and T. Kawai.
U. S. Patent No 3,575,294, 7 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 465, April 20, 1971.

Descriptors: *Patents, *Resins, *Ion exchange, Water quality, Water purification, Separation techniques, Water treatment, *Desalination, *Demineralization.

Portions of the resin layer which have decreased their ion exchange ability are removed from the ion exchange treating zone and sent to a regeneration system; at the same time regenerated resin is added to the treating zone. The system can continuously treat a large quantity of liquid. (Sinha-OEIS)
W72-14986

VAPORIZATION APPARATUS WITH FILMING AND COMPRESSION MEANS,
H. H. Bahrenburg.
U. S. Patent No 3,575,814, 3 p, 3 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 587, April 20, 1971.

Descriptors: *Patents, *Distillation, *Desalination, Sea water, Brackish water, Saline water, Potable water, *Evaporation, *Condensation, Water quality, Water treatment.

A falling film of hot sea water flowing down a tower cell surface and fins, heated by latent heat of condensation, produces fresh water vapor which is then compressed and conducted to the interior of the cells to produce additional condensation. The compressed vapors have a condensation temperature slightly higher than that of the boiling point of water, and so are effective in evaporating fresh water vapors and the sea water film on the fins and adjacent surface. (Sinha-OEIS)
W72-14989

MULTISTAGE EVAPORATION UNIT AND GAS-LIQUID DIRECT CONTACT DISTILLATION APPARATUS,
Kurita Industrial Co. Ltd. (Japan). (assignee).
J. Kijima, and T. Bekki.
U. S. Patent No 3,574,066, 3 p, 3 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 885, No 1, p 178, April 6, 1971.

Descriptors: *Patents, *Distillation, Evaporation, Condensation, Water purification, Water quality, Water treatment, Equipment, Treatment, Flash distillation, *Desalination.

This multistage flash evaporating water purification unit includes heaters, evaporators, and condensers for receiving impure water, evaporating some of it, and disharging pure cooled water. A second unit comprises a gas-liquid contacting tower including a lower gas inlet, a fan to direct gas upwards toward the tower, and a spray for spraying impure water downward. (Sinha-OEIS)
W72-14991

WATER STORAGE SYSTEM FOR REVERSE OSMOSIS PURIFICATION UNIT,
Desalination Systems, Inc., San Diego, Calif. (assignee).
R. M. Brown.

U. S. Patent No 3,568,843, 4 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 884, No 2, p 579, March 9, 1971.

Descriptors: *Patents, *Desalination, *Reverse osmosis, Brine, Membranes, *Semipermeable membranes, Water quality, Equipment, Potable water, Water purification.

Impure liquid is supplied under pressure to a module containing a semipermeable membrane, and a flow control device is provided for brine release and to maintain pressure in the module. Purified liquid is stored in a tank and held under pressure greater than atmospheric pressure. (Sinha-OEIS)
W72-14996

TRANSPORT PROPERTY REQUIREMENTS OF MEMBRANES FOR USE IN THE REVERSE OSMOSIS PROCESS AS DEFINED BY THE METHOD OF IRREVERSIBLE THERMODYNAMICS,
Office of Saline Water, Washington, D.C.
H. E. Podall.
Available from the National Technical Information Service as PB-207 944, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report 303, June 1968, 44 p, 9 fig, 6 tab, 3 ref.

Descriptors: *Reverse osmosis, *Membranes, *Ion transport, *Sea water, *Brackish water, *Desalination, Membrane processes, Osmosis, Saline water.
Identifiers: *Transport property requirements, Irreversible thermodynamics, Phenomenological coefficients, Flux, Hydraulic permeability, Solute permeability, Polluted water.

The transport property requirements of membranes for use in the reverse osmosis process are defined in terms of three phenomenological coefficients, Lp, w' and o (for salt in water) derived by application of irreversible thermodynamics to the reverse osmosis process. These coefficients are, in turn, quantitatively related to various process and performance parameters and are enumerated for three concentrations of saline waters representative of sea water, 'brackish' waters and 'polluted' waters. Finally, the phenomenological coefficients are related to the 'permeability constants,' A and B, previously derived utilizing a simple diffusional model. (OSW abstract)
W72-14999

FEASIBILITY STUDY OF CHEMICAL SEALING OF SOILS,
Diamond Alkali Co., Painesville, Ohio.
For primary bibliographic entry see Field 05B.
W72-15000

3B. Water Yield Improvement

FUTURE EFFECTS OF WEATHER MODIFICATION ON STREAMFLOW, UPPER MISSOURI RIVER BASIN,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
D. E. Dunn.
Termination Report, 1972. 3 p, 1 ref. OWRR A-048-MONT (2).

Descriptors: *Weather modification, *Cloud seeding, Streamflow, *Missouri River, *Montana, Model studies, Data collections, Hydrologic data, Input-output analysis, Streamflow forecasting, Precipitation (Atmospheric), Snowfall, Snowmelt, Hydrology.
Identifiers: *Boulder River (Mont).

The future effects of weather modification on streamflow in the Upper Missouri River Basin were derived from a simulation of the hydrograph of a mountain stream in Montana. The hydrograph was first simulated using actual weather data input and subsequently simulated with winter snowfall data input augmented. The effects of winter cloud seeding on the hydrograph were simulated by increasing the snowfall input to snow-cover by ten percent. The first prototype hydrograph studies was for the 1965-66 water-year of the Boulder River (near Contact) which drains 226 square miles of the rugged Beartooth Mountains south of Big Timber, Montana. The correspondence between simulated and prototype hydrographs was good enough to suggest that computed response to weather input was analogous to the actual response of the prototype drainage basin. The most obvious effect on the hydrograph was the augmentation of a snowmelt peak which occurred between June 27 and July 3. The true value of this peak was approximately 1080 CFS (cubic feet per per second) on June 29. The peak value of the unmodified simulation was 1024 CFS on June 29. The peak produced by augmenting snowfall by ten percent was 2017 CFS on June 27. This suggests that cloud seeding would have nearly doubled this peak, and the augmented peak would have been the second highest peak in the water-year. (Woodard-USGS)
W72-14201

ATMOSPHERIC WATER RESOURCES RESEARCH,
Fresno State Coll., Calif.
W. F. Rowland.
Available from the National Technical Information Service as PB-207 845, $3.00 in paper copy, $0.95 in microfiche. Fresno State College Foundation, Atmospheric Water Resources Research Final Contract Report, December 31, 1971. 77 p, 21 fig, 5 tab, 18 ref. USBR Contract 14-06-D-6592.

Descriptors: *Weather modification, *Cloud seeding, *Precipitation (Atmospheric), *Silver iodide, *California, Meteorological data, Cloud physics, Computer models, Radar, Storms, Aircraft, Instrumentation, Data collections, Air masses.
Identifiers: *Sierra Nevada (Calif).

Research accomplishments are summarized (Central Sierra Research) on the completed Sierra Cumulus project, and on the continuing CENSARE (Central Sierra Research) project during the period July 1, 1968 through June 30, 1971. The Sierra Cumulus project investigated the potential for enhancing water supplies through seeding summertime orographic cumulus clouds over a high elevation portion of the southern Sierra Nevada of California. The project consisted of four phases: hydrologic studies, pair seeding, quantitative determinations, and forecast tools and physical models. Increases in runoff on the order of 100% to 250% were achieved from the seeded cumulus systems, at a statistical level of significance of 0.995. The CENSARE project comprises a cooperative wintertime cloud seeding and storm observation research effort in the central Sierra Nevada. An extensive surface and upper-air instrumentation network has been developed. Radar is used for weather surveillance and specialized measurements. Silver iodide nuclei are generated by manual and remote acetone and pyrotechnic devices. Aircraft seeding has utilized pyrotechnic units. Precipitation increases are maximized when the 600 mb (about 16,000 ft above mean sea level) temperature is colder than -14 deg C. (Woodard-USGS)
W72-14232

LARGE SCALE EFFECTS OF CLOUD SEEDING--1970-1971 SEASON AND FOUR YEAR SUMMARY,
Aerometric Research, Inc., Geoleta, Calif.
K. J. Brown, and R. D. Elliott.
Available from NTIS, Springfield, Va 22151, as AD-740-128, Price $3.00 paper copy; $0.95 microfiche. Aerometric Research Inc. Final Report, October 1971. 159 p, 22 fig, 5 tab, 20 ref. Bur Reclam Contract 14-06-0-6841.

Descriptors: *Weather modification, *Artificial precipitation, *Cloud seeding, *Cloud physics, *California, Data collections, Meteorological data, Methodology, Silver iodide, Weather patterns, Winds, Velocity.

Four years of data are summarized on the large scale effects of cloud seeding in Santa Barbara County, California, sponsored by the Naval Weapons Center, China Lake, California. Seeding was accomplished from a point source using pyrotechnic seeding devices. The seeding and observation unit was a convective band. Substantial statistical evidence shows that precipitation has been significantly increased over a large area 70 to 125 miles from the seeding source. The seeding effect is highly temperature dependent, and the time duration of bands is significantly increased as a result of seeding. Shown are the interactions between convective bands, the possible effects of seeding on surface pressure, and the diurnal effects of seeding. (Woodard-USGS)
W72-14538

STOMATAL RESISTANCE AND TRANSPIRATION POTENTIAL OF BOG PLANTS,
New Hampshire Univ., Durham. Dept. of Soil and Water Science.
For primary bibliographic entry see Field 02D.
W72-14543

PROPOSED CLOSED BASIN DIVISION, SAN LUIS VALLEY PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-14573

PALEOZOIC SANDSTONE AQUIFERS IN SAUDI ARABIA,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
For primary bibliographic entry see Field 02F.
W72-14593

GROUND WATER IN CENTRAL ST. CROIX, U.S. VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 04B.
W72-14731

PLANT INDICATORS IN IRAQ, PART II - MINERAL COMPOSITION OF NATIVE PLANTS IN RELATION TO SOILS AND SELECTIVE ABSORPTION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 02G.
W72-14869

HARVESTING PRECIPITATION FOR A DEPENDABLE, ECONOMICAL WATER SUPPLY,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
M. L. Fairbourn, F. Rauzi, and H. R. Fardner.
Journal of Soil and Water Conservation, Vol. 27, No. 1, p 23-26. January/February 1972. 2 fig, 2 tab, 17 ref.

Descriptors: *Precipitation (Atmospheric), *Harvesting, *Water supply, Costs, Economic feasibility, Ranges, Data collections, Water storage, Durability, Planning.
Identifiers: *Harvesting precipitation, Catchment, Adaptability.

A solution to the water distribution problem in efficient use of range forage is to harvest and use

precipitation that falls on rangeland. The initial cost of precipitation is high, but the annual cost is relatively low, and the water supply is dependable. The design of a dependable water harvesting system requires long-term precipitation data, including the total average annual precipitation, the high and low variation from the average, and the months of the year when precipitation is most likely to occur. With such data, the potential water supply can be estimated. There are several types of commercially available catchment surface materials: steel, asphalt roofing, gravel-on-plastic, butyl rubber, asphalt-paved, and asphalt sealants. Adaptability of a ground cover to a particular site must be considered in terms of availability of materials and equipment, site accessibility, maintenance requirements, soil type, and total cost. Transportation charges from the manufacturer to the site may vary widely from one location to another. Some materials tested for water harvesting have not been observed long enough to determine their durability. Water storage structures must also be evaluated for adaptability to a particular site. The storage structure usually accounts for 60-80% of the cost of a water harvesting system. Provision for inlet, outlet, and emergency overflows and fencing must be included in the cost of any type of structure. Seepage and evaporation losses also should be controlled. Careful planning of this part of the water system is essential. The desirability of steel, butyl rubber, a polyethylene lining, and an open pond as storage structures are discussed. (Strachan-Chicago)
W72-14896

A SURVEY OF THE PHREATOPHYTIC TREES OF THE REPUBLICAN RIVER VALLEY, NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
P. J. Rand.
Available from the National Technical Information Service as PB-212 381, $3.00 in paper copy, $0.95 in microfiche. Nebraska Water Resources Research Institute Project Completion Report, June 1, 1972. 69 p, 13 fig, 14 tab, 51 ref, 3 append. OWRR A-019-NEB (2).

Descriptors: *Phreatophytes, *Trees, *Cottonwoods, Willow trees, Consumptive use, Vegetation, Nebraska.
Identifiers: Peachleaf willow, Republican River Valley (Neb).

The woody phreatophyte communities of the Republican River Valley were studied by means of 33 transects located at 4-8 mile intervals along the 285 miles of its course in Nebraska. Two principal types of communities are present and are located, respectively, on the west and east halves of the valley: (a) those in which cottonwood and peachleaf willow are the sole dominants and (b) those in which cottonwood and peachleaf willow have high importance values but in which there is a well-developed understory of mixed hardwood species. Thirteen species of trees were found in the transects and three others were seen in stands along the river. Of these, cottonwood is the most important. It averages over 100 trees per acre throughout the valley, contributed a third or more of the canopy coverage in all stands, and has an average basal area of 40.79 feet per acre. Peachleaf willow is the next most important tree in the phreatophyte stand and shares dominance to the west with cottonwood. Secondary species of importance are boxelder, mulberry, green ash and slippery elm, but their importance values are one-tenth as large as cottonwood. Humans have used the Republican River Valley and its plants for at least the last 2,000 years, but their influence on plant community structure and composition seems to have been less important than shifting climatic regimes and periods of flooding. What the present series of manipulations of water flow by man will do to the natural succession of phreatophytes remains to be seen. His management, however, will be less than successful unless he pays attention to the growth of cottonwood.
W72-14914

EFFECT OF CATCHMENT AREA ON FLOOD MAGNITUDE,
Australian Rivers and Water Supply Commission, Victoria, New South Wales.
For primary bibliographic entry see Field 02A.
W72-14946

PRELIMINARY STUDIES IN THE TERRESTRIAL DISPOSITION OF SILVER FROM CLOUD SEEDING,
Colorado State Univ., Fort Collins. Dept. Watershed Science.
For primary bibliographic entry see Field 05B.
W72-14953

THE ROLE OF ELECTRICAL FORCES IN THE DEVELOPMENT AND DISSIPATION OF CLOUDS AND FOGS,
University of Manchester Inst. of Science and Technology (England).
For primary bibliographic entry see Field 02B.
W72-14963

3C. Use of Water of Impaired Quality

A METHOD OF DEMINERALIZATION USING STRONGLY ION EXCHANGE RESINS,
New Mexico State Univ., University Park. Engineering Experiment Station.
For primary bibliographic entry see Field 03A.
W72-14679

PLANT INDICATORS IN IRAQ. PART I - NATIVE VEGETATION AS INDICATOR FOR SOIL SALINITY AND WATERLOGGING,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 02G.
W72-14868

ON THE DELIMITATION OF GROUNDWATER RECHARGE AREAS AROUND BERJESIYAH,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 04B.
W72-14870

HYDROLOGICAL AND SOIL PHYSICAL CONDITIONS IN A PILOT AREA IN THE GREATER MUSSAYEB PROJECT,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 02G.
W72-14871

PRELIMINARY STUDIES ON GROUNDWATER IN SAMARATIKRIT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 04B.
W72-14872

3D. Conservation in Domestic and Municipal Use

INTERGOVERNMENTAL RELATIONS IN WATER RESOURCES ACTIVITIES.
Wendell and Schwann, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14238

METHODS FOR PREDICTING URBAN DRAINAGE COSTS,
Agriculture Research Service, Boise, Idaho. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W72-14390

THE IMPORTANCE OF ECONOMIC FACTORS IN URBAN WATER SUPPLY SYSTEMS,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 06B.
W72-14430

URBANIZATION, WATER POLLUTION, AND PUBLIC POLICY,
Barnard Coll., New York.
For primary bibliographic entry see Field 05G.
W72-14437

PLANNING OF REGIONAL WATER RESOURCE SYSTEMS FOR URBAN NEEDS,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06D.
W72-14638

RELATIONSHIPS BETWEEN SUPPLIES AND PROJECTED DEMANDS FOR WATER IN A SIX-COUNTY URBANIZING REGION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06D.
W72-14639

SUGAR AND BRIAR CREEKS PROJECT, CATAWBA RIVER BASIN, NORTH CAROLINA AND SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-14755

BALDWIN AND HANNON SLOUGHS, MONTGOMERY, ALABAMA, FLOOD PROTECTION (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14768

BLOMQUIST V. COUNTY OF ORANGE (STATE CONSERVATION LAW COMPLIANCE AS A CONDITION TO WATER SUPPLY DEVELOPMENT).
For primary bibliographic entry see Field 06E.
W72-14777

RELATIVE POLLUTION STRENGTHS OF UNDILUTED WASTE MATERIALS DISCHARGED IN HOUSEHOLDS AND THE DILUTION WATERS USED FOR EACH,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.
W72-14839

ZONING FOR BEAUTY,
Ross, Hardies, O'Keefe, Babcock, McDugald and Parsons, Chicago, Ill.
For primary bibliographic entry see Field 06F.
W72-14880

THE PLANNING LAND-USE CONTROL RELATIONSHIP: A LOOK AT SOME ALTERNATIVES,
Illinois Univ., Urbana. Coll. of Law.
For primary bibliographic entry see Field 06B.
W72-14881

THE HOUSTON SOLUTION: THE CASE FOR REMOVING PUBLIC LAND-USE CONTROLS,
For primary bibliographic entry see Field 06F.
W72-14883

CITY PLANNING AND POLITICAL VALUES,
Rutgers - The State Univ., New Brunswick, N.J.; and Columbia Univ., New York.
For primary bibliographic entry see Field 06E.
W72-14884

PROPOSALS FOR A NON-ESCAPIST NATIONAL URBAN GROWTH POLICY,
For primary bibliographic entry see Field 06B.
W72-14885

OMAHA'S PLATTE RIVER WATER TREATMENT PLANT,
Omaha Metropolitan Utilities District, Nebr.
For primary bibliographic entry see Field 05D.
W72-14887

A CASE HISTORY IN GROUND WATER COLLECTION,
Public Utilities, Mankato, Minn.
For primary bibliographic entry see Field 04B.
W72-14889

THE PROFESSIONAL URBAN PLANNER,
Central Naugatuck Valley Regional Planning Agency, Waterbury, Conn.
For primary bibliographic entry see Field 06B.
W72-14894

EFFECTIVE USE OF TV SEWER INSPECTION AND SEALING,
Halliburton Co., Duncan, Okla.
For primary bibliographic entry see Field 08G.
W72-14898

OIL EXTRACTION, URBAN ENVIRONMENT, AND CITY PLANNING,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 05G.
W72-14899

METROPOLITAN GROWTH -- ENCROACHMENT OR ORDERLY PROCESS,
Department of Housing and Urban Development, Washington, D.C. Land and Facilities Development Administration.
For primary bibliographic entry see Field 05G.
W72-14910

URBAN OPEN SPACE: PSYCHO-SOCIO AND LEGAL DIMENSIONS,
Colorado Open Space Foundation, Denver.
For primary bibliographic entry see Field 06B.
W72-14911

BOULDER, COLORADO: A STUDY IN GROWTH,
Colorado Univ., Boulder.
J. E. Flack.
In: Man and the Quality of His Environment, Western Resources Conference, 1967, University of Colorado Press, Boulder, 1968, p 223-229.

Descriptors: *Environment, *Growth rates, *Technology, *City planning, Quality control, Management, Design criteria, Water pollution, Water supply, Flood plains, Solid wastes, Transportation, Education, Research and development.
Identifiers: *Boulder (Colo), *Metropolitan water resources management.

A case study of Boulder, Colorado was used to show the impact of growth and technology on a community's natural environment. Invited speakers discussed problems associated with preserving and enhancing the environmental quality of Boulder. Following these presentations, a panel representing the Inter-Professional Committee for Environmental Design (IPCED) made recommendations for designing the environmental setting of the case study community. (1) Boulder has done a good job in most of its environmental problems. (2) Water supply and air pollution management programs are being pursued with vigor. (3) Recognition and concern with water pollution and problems related to the central core are receiving intensive study and plans will be developed. (4) Flood plain management needs additional concern in the form of action programs rather than planning as such. (5) The provision of greenbelts and an adequate transportation system will receive much support in the near future. (6) The solid wastes problem will continue to be of concern. (7) There is a need for educating the public in environmental quality and design. (Strachan-Chicago)
W72-14912

ECONOMIC GROWTH AND ENVIRONMENTAL COSTS,
Coe Coll., Cedar Rapids, Iowa.
For primary bibliographic entry see Field 06G.
W72-14913

3E. Conservation in Industry

GEOTHERMAL STEAM IN THE GEYSERS--CLEAR LAKE REGION, CALIFORNIA,
For primary bibliographic entry see Field 02F.
W72-14351

WATER CONSUMPTION STUDY FOR NAVAJO PLANT,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
For primary bibliographic entry see Field 05G.
W72-14413

EFFECTS OF POLLUTION CONTROL ON THE FIRM,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05G.
W72-14420

EFFECTIVE POLLUTION CONTROL IN INDUSTRIALIZED COUNTRIES: INTERNATIONAL ECONOMIC DISINCENTIVES, POLICY RESPONSES, AND THE GATT,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 05G.
W72-14426

THE DEEP SEABED HARD MINERAL RESOURCES BILL,
Auckland Univ. (New Zealand).
For primary bibliographic entry see Field 06E.
W72-14549

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATER ALONG THE LOUISIANA COAST (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 05G.
W72-14756

THE NATIONAL OCEAN PROGRAM, IMPLEMENTATION AND BENEFITS,
For primary bibliographic entry see Field 06E.
W72-14780

RECYCLING: A PAPER COMPANY'S APPROACH.
For primary bibliographic entry see Field 05D.
W72-14888

OIL EXTRACTION, URBAN ENVIRONMENT, AND CITY PLANNING,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 05G.
W72-14899

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AFB FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-14928

3F. Conservation in Agriculture

ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING, AND MANAGING WATER RESOURCES IN AGRICULTURE.
Economic Research Service, Madison, Wis.

Cooperative Regional Project Termination, Project No. NC-57, February 1972. 43 p, 168 ref.

Descriptors: *Water utilization, *Bibliographies, *Water resources development, Water management (Applied), Information retrieval, Technical writing, Water policy, Regulation, Reviews, Irrigation, Irrigation engineering, Water law, *Legal aspects, Water quality control, Water pollution, Watercourses (Legal aspects), Water supply, Water rights, Administration, Riparian rights, Appropriation, *Agriculture.
Identifiers: North Central US.

The research project was terminated because most of the work contemplated was completed and a new program for funding such regional research projects was developed. The project had four objectives: (1) to determine the economic considerations affecting use and management of water in agriculture and competing uses; (2) identify and describe rights in water and administrative arrangements regulating water use in the United States; (3) to analyze the economic consequences of different systems of water law; and (4) to develop principles which will serve as guidelines in efforts to bring about optimum management of water uses. This project related to both qualitative and quantitative aspects of water use problems in the midwestern states, referred to as the North Central Region. A bibliography and comments are included under each of the first three objectives. The information herein accumulated from the various studies contributed to the general fund of knowledge concerning economic and legal aspects of water-use and management in agriculture and the use-conflict problems arising within and between agriculture and other uses. (Brackins-Florida)
W72-14256

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO (PART 1).

Hearing--Subcomm. on Irrigation and Reclamation--Comm. on Interior and Insular Affairs, House of Representatives, 92d Cong, 2d Sess, March 11, 1972. 103 p.

Descriptors: *Idaho, *Water resources development, *Irrigation programs, *Legislation, Water conveyance, Water distribution (Applied), Water sources, Rivers, Impoundments, Prior appropriation, Water rights, Legal aspects, Water utilization, Multiple-purpose projects, Pumping, Pumped storage, Federal government, Federal jurisdiction, State governments, Groundwater recharge.

Identifiers: *Salmon Falls Division, *Snake River.

The report contains testimony from local residents, industry representatives and governmental officials concerning the proposed plan of development for the Salmon Falls division of the Upper Snake River project in Idaho. A copy of H.R 2474 which would initiate work is included. Testimony concerns the increased need for water in the region and the shortage of water which currently exists for agriculture. The project would divert 181,600 acre-feet of water annually from the Snake River for use in agriculture, fish and wildlife development, and groundwater recharge. Testimony also covers the complex situation of local appropriated water rights and how the proposed project might influence it. Members of several canal and irrigation companies present their viewpoints on the situation. The economic difficulties of the region, which stem from an inadequate water supply, are also discussed. Reaction to the project from witness is favorable to the project. (Grant-Florida)
W72-14257

EFFECT OF TREATMENTS GIVEN TO THE GRAIN, ON THE GROWTH OF WHEAT ROOTS UNDER DROUGHT CONDITIONS,
Buenos Aires Univ. (Argentina). Facultad de Agronomia y Veterinaria.
M. S. Carceller, and A. Soriano.
Can J Bot. 50 (1): 105-108. Illus. 1972.
Identifiers: *Drought, Grain, Growth, *Roots, Stress, *Wheat-M.

The effect of (desiccation) pretreatments given to wheat grains which are supposed to increase drought resistance was studied in young plants under controlled conditions of water stress. In one of the 2 cultivars used, root growth was found to be significantly greater in plants from pretreated seeds, during and after a period of water stress. Under conditions of ample water availability, root growth was not influenced by the pre-treatments.--Copyright 1972, Biological Abstracts, Inc.
W72-14293

AGRICULTURE RESEARCH DIVISION ANNUAL REPORT, 1970-1971.
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.

New Zealand Dept of Agriculture Winchmore Irrigation Station Annual Report, 1972. 15 p, 1 tab, 9 ref.

Descriptors: *Experimental farms, *Agriculture, *Irrigation, *Crop response, *Agronomy, Fertilizers, Methodology, Crop production, Soil moisture, Soil properties, Soil chemistry, Wheat, Barley, Clovers, Livestock, Food and cover crops, Pest control, Insects.
Identifiers: *New Zealand, Viner peas, Lucerne, Turnips, Tama.

Winchmore Irrigation Research Station, New Zealand, is located in Mid-Canterbury, a few miles from Ashburton. It consists of 750 acres, typical of much of the 1 million acres of flat land in the South Island. Research is concerned primarily with irrigation techniques and production of livestock and crops under irrigation. Crop response data are reported for wheat, grasses, clovers, peas, lucerne, turnips, barley, and tama. Data concerning the kind and amount of insects eaten by starlings also are reported. Four seasons (1967-71) of study on the irrigation of Aotea wheat show that the optimum is one watering when the soil moisture reaches wilting point. The increase in grain production ranged from 28 to 148 percent. (Woodard-USGS)
W72-14375

WATER RESOURCE MANAGEMENT IN NORTHERN MEXICO,
Resources for the Future, Inc., Washington, D.C.
R. G. Cummings.
Prepared by: Resources for the Future, for RFF Latin American program, and distributed by Johns Hopkins University Press, Baltimore, Md. 21218, p 1-68, 1972. 3 fig, 28 tab, 33 ref, 1 append.

Descriptors: *Mexico, *Dynamic programming, *Linear programming, *Water management (Applied), *Irrigation efficiency, *Water allocation (Policy), Crops, Farms, Income, Optimization, Model studies, Groundwater, Surface waters, Reservoirs, Land, Labor, Systems analysis, Rivers, Irrigation districts.
Identifiers: *Howard's Policy Iteration, *Comarca Lagunera (Mex), Water releases, Water quotas, Crop patterns, Evaporation losses, Southern Coahuila, Northern Durango.

Dynamic programming and Howard's Policy Iteration technique are used to derive efficient irrigation allocation policies for the Comarca Lagunera irrigation district in northern Mexico. These techniques are applied to the problem of determining the intertemporal pattern of annual water release, as well as the intratemporal use pattern for annual releases, crop patterns, water quotas for farm allocation, and interzonal distributions that maximize the present value of expected incomes, given the relevant structure of the technological and economic conditions in that district. Appropriate benefit functions are derived by linear programming. Alternatives to surface water storage are discussed as a means of stabilizing interannual income. The alternatives include insurance in the form of money or agricultural products, and conjunctive groundwater management. Evaporation losses from surface reservoirs in this arid region prove to be a major deterrent to holding large reservoir stocks, given surpluses of land and labor and an income maximization objective. (Bell-Cornell)
W72-14389

PLANT POPULATION EFFECTS ON THE EFFICIENT USE OF WATER: WATER UPTAKE CHARACTERISTICS,
Agricultural Experiment Station, Stillwater. Okla.
J. F. Stone.
Available from the National Technical Information Service as PB-212 263, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, July, 1972, 44 p, 8 fig, 11 tab. OWRR B-012-OKLA (1).

Descriptors: *Water utilization, *Water conservation, *Planting management, *Evapotranspiration, Soil-water-plant relationships, Energy budget, *Oklahoma, *Hydrologic budget, *Peanuts, Crops, Farm management, *Plant groupings.

Effects of crop geometry on the evapotranspiration (ET) of water were studied over two growing seasons at the Cadde Research Station, Ft. Cobb, Oklahoma. Peanuts were grown in 12-inch rows and 36-inch rows. Plots were oriented with rows north-south and east-west. The four combinations of these treatments were replicated three times each year. A water budget on accrued water was computed each year. Difference of water content between dates was sensed with a neutron probe. These differences were corrected for either drainage or accretion from below by the deduction of a computed integrated water flux. This flux was determined from tensionmetric measurement of total hydraulic head and pressure head across the fifth foot of the profile. In actual practice, the tensionmeter measurements did not permit useful estimates of the flux, being too erratic. However, they did indicate the periods of the season where there was zero or negligible flux through the fifth foot. During such periods, the neutron probe indication of water loss was a direct estimate of ET. The results indicated that during peak water use the 12-inch rows with north-south orientation lost water at nearly half the rate of the highest user: the 36-inch north-south rows. East-west rows were intermediate, but the higher population (12-inch rows) tended to lose the lesser. Plants grown in the 12-inch rows consistently yielded higher than the 36-inch rows' plants. Quality was about the same over the entire study.
W72-14433

THE SUN'S WORK IN A CORNFIELD,
Agricultural Research Service, Ithaca, N.Y.
E. Lemon, D. W. Stewart, and R. W. Shawcroft.
Science (Wash). Vol 174, No 4007, p 371-378. 1971. Illus.
Identifiers: *Model studies, *Soil-water-plant relationships, Air-earth interfaces, Atmosphere, Climate, Corn (field), Plants, Soils, Sun.

After extensive field experiments, SPAM (soil-plant-atmosphere model), a comprehensive mathematical model that simulates energy and material exchange in the plant-air layer at the earth's interface was developed. The model is based upon the conservation of energy, where the sun is the driving force. Understanding and deficiencies were gauged initially by testing model predictions against actual experience with a relatively simple system, a cornfield. Climatic predictions are physically and biologically good enough for many applications, but they reveal inadequacies in the understanding of the fluid dynamics of airflow within the plant stand. The present inability to measure or predict the degree of wetness of the soil surface hampers correct prediction of evaporation. Probably the most difficult problem to resolve is that of predicting how stomates open and close under drought stress, thus affecting both evaporation and photosynthesis in leaves. Along with resolution of these problems, the basic framework of the model can be adapted to more complex systems in nature, where variability is much greater than in an agricultural crop. The model in its present form can be used, with caution, as a powerful tool to help man order his priorities of plant community traits for whatever outcome he desires, be it food production, nature and water conservation, climate modification, or esthetic enjoyment.--Copyright 1972, Biological Abstracts, Inc.
W72-14436

CHANGES IN RESISTANCE TO FLOW OF WATER THROUGH A SOIL-PLANT SYSTEM,
Connecticut Univ., Storrs.
B. E. Janes, and G. W. Gee.
Available from the National Technical Information Service as PB-212 279, $3.00 in paper copy, $0.95 in microfiche. Connecticut University Research Project Technical Completion Report, Nov 3, 1970. 6 p, 1 ref. OWRR A-027-CONN (1).

Descriptors: *Soil-water-plant relationships, *Plant growth, *Plant physiology, Testing procedures, Root systems, Leaves, Water balance, Crop response, Soil moisture, Soil properties, Evapotranspiration, Agronomy.
Identifiers: *Pepper plants, Water potential gradients.

A method employing the use of both a hanging water column and a field type thermocouple psychrometer was developed to control and measure water potential gradients in pepper plants with confined root systems. Small soil containers were constructed with Millipore filters arranged so that they confined the root system but allowed water transport to the roots. Hydrostatic pressures in leaf petioles were in agreement with those found in the plant top and agreed well with the psychrometrically determined root zone water potential measurements. On the other hand, water potentials inferred from hydrostatic pressure measurements average 4 bars higher in the plant roots than in the plant tops. A nonlinear relationship between transpiration rate and decreasing root zone water potential was observed for plants allowed to dry to wilting and also plants controlled

at a high matric potential but subjected to controlled decreases in total water potential. (Woodard-USGS)
W72-14523

SOIL SURVEY OF TUCSON-AVRA VALLEY AREA, ARIZONA,
Soil Conservation Service, Tucson, Ariz.
For primary bibliographic entry see Field 02G.
W72-14576

TILLAGE AND HERBICIDES FOR SURFACE RESIDUE MAINTENANCE, WEED CONTROL, AND WATER CONSERVATION,
Southwestern Great Plains Research Center, Bushland, Tex.
P. W. Unger, R. R. Allen, and A. F. Wiese.
Journal of Soil and Water Conservation, Vol. 26, No. 4, p. 147-150, July-August, 1971. 5 fig, 3 tab, 28 ref.

Descriptors: *Herbicides, *Weed control, *Water conservation, *Wheat, *Soil moisture, Grain sorghum, Water table, Water wells, Harvesting, Planting management, Crop response, Fallowing, Precipitation (Atmospheric), Irrigation practices, Great Plains.

Declining water tables and well yields threated the future of irrigated agriculture in the Southern Great Plains. This study determines the effectiveness of tillage and herbicides for maintaining surface residues, controlling weeds and volunteer wheat, and storing precipitation as soil water during the period from wheat harvest to grain sorghum planting. The cropping sequence was an irrigated wheat-sorghum-fallow regimen. About 10,000 pounds of residue per acre were present in July when the study began. Surface residues ranged from less than 200 to 4,100 pounds per acre in the following spring. Weed control ranged from 44 to 100 percent. Increase in available soil water ranged from 2.0 to 5.6 inches. Increase in soil-water storage resulted from maintaining residues at the surface, suggesting a potential for storing precipitation for later plant use. Added soil-water stored by herbicide treatment compared with tandem-disk treatment nearly equaled that stored by preplant irrigations. (Popkin-Arizona)
W72-14577

CATTLE FEEDERS MUST COMPLY WITH ANTI-POLLUTION LAWS,
For primary bibliographic entry see Field 06E.
W72-14579

OPTIMIZING FURROW STREAMS TO PREDICT IRRIGATION SYSTEM EFFICIENCIES,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
T. C. Patterson.
Journal of Soil and Water Conservation, Vol. 26, No. 5, p. 201-204. Sept.-October, 1971, 8 fig., 4 ref.

Descriptors: *Irrigation efficiency, Hydraulic properties, *Furrow irrigation, *Continuity equation, *Mathematical studies, Optimization, Furrows, Forecasting, Planning, Slopes, Streams, Length, Intakes, Depth, Equations, Water conservation.
Identifiers: *Optimum stream concept.

Planning an irrigation development requires consideration of the effects of certain parameters such as: slope, stream size and length of run, and the actual application efficiency potential of the system. Sets of curves were developed for furrow system design and irrigation efficiency, hydraulic parameters versus depth, time-intake relationships, water advance, stream advance, and stream size versus efficiency. Theoretical advance prediction was checked against field data. Furrow hydraulics, time-intake relationships, computing the advance and optimizing the stream are discussed mathematically. A furrow stream's advance for a given set of conditions can be accurately predicted using continuity theory. Optimum stream concept is a legitimate means of establishing broad guidelines for the design of furrow irrigation systems. Important graphs and equations are presented. (Popkin-Arizona)
W72-14581

THE POTENTIAL, THE PROBLEMS, AND THE STATUS OF USING PROTEINS OF AQUATIC ORIGIN AS HUMAN FOOD,
Massachusetts Inst. of Tech., Cambridge. Education Research Center.
E. R. Pariser.
Food Technol. Vol 25, No 11, p 88-100. 1971. Illus.
Identifiers: *Algae, Aquatic plants, Arthropods, *Fish proteins, Food, Mollusks, *Proteins.

The status and future expectations regarding the use of aquatic plants (algae) and animals (molluscs, arthropods, fish) as human food are discussed. The resource and its harvesting, processing and use are described, with particular emphasis on fish protein concentrate and fish meat emulsions. The USA approach to the use of aquatic protein is contrasted with that of other countries.--Copyright 1972, Biological Abstracts, Inc.
W72-14582

THE USE OF WASTE HEAT IN AGRICULTURE,
Arizona Univ., Tucson. Environmental Research Lab.
M. H. Jensen.
In: Waste Heat Utilization: Proceedings of the National Conference, October 27-29, 1971, Gatlinburg, Tennessee. Oak Ridge National Laboratory, 1972, p 21-38. 4 tab, 2 photo, 1 fig, 6 ref.

Descriptors: *Environmental effects, *Greenhouses, Agronomy, *Crop production, *Environmental engineering, *Heated water, *Crop response, *Environmental control, *Waste heat disposal, *Reclaimed water, *Water reuse, Mexico, Steam, Economics, Thermal pollution, Arizona, Hydroelectrical plants, Soil conservation, Water conservation, Irrigation engineering, Industrial water, Structures, Water temperature, Water cooling, Microenvironment.
Identifiers: Gulf of California, Puerto Penasco.

Warm water from the Gulf of California and the Arabian Gulf is being used in Mexico and Abu Dhabi respectively to heat and cool greenhouse facilities developed by the University of Arizona at Tucson. Yields of vegetables grown in greenhouse environments where warm water is used have been extremely high when compared to the same crops grown outdoors. Since one of the major costs in greenhouse production is heating, the feasibility of using waste heat from power plants to enhance an environment for crop production holds great potential. Studies show that higher yields could offset cost of growing unit. (Black-Arizona)
W72-14584

BLACK CATTLE AND DRY WEATHER,
J. Jennings.
The Cattleman, Vol. 58, No. 1, p. 39, 58. June 1971. 2 fig.

Descriptors: *Feeding rates, *Drought tolerance, *Droughts, *Browse utilization, *Cattle, Pasture, Brush, Surface runoff, Water wells, Irrigation water, Weight, Winter, Wheat, Crop production.

Cattle feeding practices used in drought are reported. Pasture is kept brush-free by grubbing and reseeding. A year's supply of feed is kept for drought. Limited runoff and water wells which require investment water the cattle and provide an irrigation source. Black Angus cattle appear to gain weight in drought conditions on stored feed and winter pastures of irrigated rye and wheat. Experiences of an Angus rancher are recorded in his trials with black cattle and dry weather. (Popkin-Arizona)
W72-14585

WASH AWAY THOSE IRRIGATION BLUES,
J. K. Ballard.
American Fruit Grower, Vol. 91, No. 4, p. 13-14, 48, April 1971. 1 photo, 6 fig.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Fruit crops, *Irrigation efficiency, *Frost prevention, Costs, Labor, Dusts, Grasses, Rusts, Trees, Plant diseases, Control, Herbicides, Orchards, Heating, Calcium, Washington.

Overtree sprinkling and other permanent irrigation systems are becoming popular because of low cost, labor requirements, and convenience. Dust is washed away, and grass establishment is firm. Termites and fruit rust are controlled. Experiments with herbicides over orchards irrigated by overtree sprinklers indicate high efficiency and ease of operation. Overtree sprinkling gives a better finish to fruit. Other permanent irrigation systems in Washington include drop hoses, and trickle or drip hoses. Conversion from gas to water heating is also popular as a dual irrigation and heating system for fruit. Calcium is added to the fruit by overtree practices, which improves the fruit. (Popkin-Arizona)
W72-14588

DRIP IRRIGATION: NO LONGER A NOVELTY.
Citrograph, Vol. 58, No. 8, p. 247, 268-269. 1971. 5 fig.

Descriptors: *Irrigation practices, *Water conservation, *Citrus fruits, *Sprinkler irrigation, *Water conveyance, Irrigation efficiency, Agriculture, Standards, Filtration, Clogging, Irrigation systems, Movement, *California.
Identifiers: *San Diego County (Calif).

Drip irrigation is a novelty in most western agriculture, but the potential for water conservation and variety of systems currently available are attractive. About 600 commercial acres in San Diego County, California are drip irrigated. Individual cases of drip irrigation usage are reported. The systems are applied to avocados, oranges, lemons, tangelos, and all citrus. These systems improve efficiency and put the water where needed. Filtration of sprinklers and clogging of conveyances are problems. Water movement patterns for drip irrigation systems are presented. Such systems are widely accepted in Israel. (Popkin-Arizona)
W72-14589

AN EVALUATION OF IRRIGATION POTENTIAL IN THE BONANZA VALLEY,
Minnesota Univ., Benson. Agricultural Extension Service.
L. M. Ross.
1971. 19 P, 9 FIG, 16 TAB, 2 MAP, 24 REF.

Descriptors: *Groundwater, *Irrigation wells, *Aquifer characteristics, *Water quality, *Minnesota, Water supply, Water yield, Pumping, Crops, Soil properties, Irrigation systems, Costs, Precipitation (Atmospheric), Groundwater recharge, Hydrologic data, Water table, Crop production.
Identifiers: *Bonanza Valley (Minn).

This publication is the first specifically prepared for the Bonanza Valley (Minnesota) irrigation area. It provides an inventory of water resources and geological survey maps, defines the irrigable areas, and highlights important crop and economic considerations. The Bonanza Valley is a 320

square mile area of sandy glacial outwash in Pope, Stearns, and Kandiyohi Counties. Irrigation will increase productivity of the droughty and presently marginal land. Information on soils, water supply, climate, marketing, and management is presented to help evaluate the potential for irrigation in this area. Water tested was low in alkaline salts and boron, indicating that it is suitable for irrigation. Generally, high yielding wells are possible along the western and southwestern sides of the area. (Woodard-USGS)
W72-14611

THE MEASUREMENT OF THE DEMAND FOR IRRIGATION WATER WITH SPECIAL REFERENCE TO SOUTHWEST KANSAS,
Kansas Water Resources Research Inst., Manhattan.
A. W. Biere, and J. I. Perng.
Available from the National Technical Information Service as PB-212 281, $3.00 in paper copy, $0.95 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No 81, June 1972. 17 p, 24 fig, 2 tab, 12 ref. OWRR A-034-KAN (1).

Descriptors: *Irrigation water, *Dynamic programming, Evapotranspiration, Plant growth, *Model studies, *Water demand, Water utilization, *Evaluation, *Irrigation efficiency.
Identifiers: *Irrigation scheduling, Economic models.

The objective was to improve the estimates of the value of irrigation water. This information is essential to the development of efficient irrigation systems and groundwater management policies. The conventional method of evaluating the value of irrigation water (based on the agronomic production function) has lacked the desired level of precision. This study attempts to formulate an analytical model which incorporates various relationships associated with plant growth. The model has two major components: (1) the soil water budget and the crop evapotranspiration function; and (2) biological growth curves. Computer simulations were made to check the validity of the model and the estimated coefficients. The above mentioned growth model was incorporated into an economic irrigation scheduling model. This model was solved using dynamic programming. The objective was to schedule the irrigations so as to maximize the net returns from irrigated production. The model also points out the significance of the cost of water, and its impact on the quantity demanded for irrigation.
W72-14677

PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF PLANTS TO DIFFERENT INTERNAL WATER POTENTIALS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 02I.
W72-14835

AUTECOLOGICAL STUDIES ON RAJASTHAN DESERT PLANTS: III. SEED OUTPUT AND GERMINATION IN TRIANTHEMA PORTULACASTRUM L.,
Birla Inst. of Tech. and Science, Pilani (India).
M. C. Joshi, and B. C. Nigam.
Trop Ecol. Vol 11, No 2, p 140-147. 1970. Illus.
Identifiers: Desert, *Germination, India, Light, Plants, Scarification, *Seeds, Temperature, *Trianthema portulacastrum D.

The seed output, seed germination and reproductive capacity in T. portulacastrum L., an annual weed of crop and waste fields in tropical and temperate regions are discussed. The number of seeds per fruit differs from locality to locality, and in plants of different habits. The percentage seed germination falls with passage of time. Mechanical scarification quickly enhances the seed germination by allowing the water imbibition. Seed germination also increases under alternate light and dark conditions. High temperature treatment for short duration stimulates the germination in fresh as well as old seeds. Seedling survival (63%), reproductive and aggressive capacities (2634 and 1659, respectively) are quite high. The soil of cultivated fields, being rich in water holding capacity and organic matter, support the maximum occurrence of this weed.--Copyright 1972, Biological Abstracts, Inc.
W72-14857

STUDIES ON PHYSIOLOGICAL ECOLOGY OF BORRERIA ARTICULARIS (LINN. F.) F. N. WILL: A COMMON WEED OF BAJRA (PENNISETUM TYPHOIDES (BURM. F.)) (STAPF. ET C. E. HUBB.) FIELDS,
S. S. Coll., Alipur (India). Dept. of Botany.
V. Babu, and M. C. Joshi.
Trop Ecol. Vol 11, No 2, p 126-139. 1970.
Identifiers: *Plant physiology, Bajra-M, *Borreria articularis D, Cold, Dormancy, Ecology, Gibberellic acid, Inhibitors, Pennisetum typhoides M, Seeds, Weeds.

B. articularis has adapted to the monsoon climate in the arid and semi arid regions, through seed-dormancy. Seed production is high in certain localities. Dormancy is due to endogenous inhibitors and can be overcome by gibberellic acid or cold treatment together with prolonged washing. The mechanism of dormancy by the species helps in survival and perpetuation of the species. The seeds are negatively photoblastic and require a temperature of 30 to 35 degree C. The germination at 75% (12.61% soil moisture) field capacity is more. Causes of seed mortality are studied and the reproductive capacity of the plant was worked out.--Copyright 1972, Biological Abstracts, Inc.
W72-14861

IF THE PUMPS RUN DRY...,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 04B.
W72-14865

IRRIGATION AND FERTILIZATION WITH WASTEWATER,
Idaho Univ., Moscow. Dept. of Civil Engineering; and Idaho Univ., Moscow. Dept. of Hydrogeology.
D. D. Eier, A. T. Wallace, and R. E. Williams.
Compost Science Journal of Waste Recycling, Vol 12, No 3, May-June 1971, p 26-29. 2 fig, 1 ref.

Descriptors: *Irrigation, *Fertilization, *Waste water (Pollution), *Waste water disposal, *Water pollution control, Economic feasibility, Streams, Sewage effluents, Algae, Tourism, Recreation, Fisheries, Hydroelectric power, Navigation, Consumptive use, Water pollution, Oxygen, Soil properties, Idaho.

An economically palatable method of water pollution control is presented. The plan presents the entry into streams of the $18 worth of nutrients per acre foot of secondary treatment plant effluent. Drifting islands of algae in rivers, and fertilizer demands can be reduced. Tourism, recreation, fishery production, hydroelectric power, navigation, irrigation agriculture, and domestic and industrial use of the Snake River in southern Idaho are affected by water pollution. Particular problems include taste, odor, bacterial contamination, aquatic growth and thermal effects. The principal cause of this pollution is the disposal of untreated or inadequately treated wastes. The wastes reduce available oxygen and encourage growth of undesirable algae. Control of nutrient input would go a long way in reducing this pollution. Crop irrigation or surface application of domestic and industrial waste water for soil renovation is suggested. Investigations at the University of Idaho indicate irrigation and fertilization with waste water are feasible and economical. (Popkin-Arizona)
W72-14878

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

FUTURE EFFECTS OF WEATHER MODIFICATION ON STREAMFLOW, UPPER MISSOURI RIVER BASIN,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 03B.
W72-14201

ENVIRONMENTAL CONSTRAINTS ON THE SUBSTITUTION OF SPACE FOR TIME IN THE STUDY OF NATURAL CHANNEL NETWORKS,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 02E.
W72-14203

POTENTIAL UNITED STATES WATER--SUPPLY DEVELOPMENT,
Geological Survey, Washington, D.C.
C. H. Hardison.
American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 98, No IR3, p 479-492, September 1972. 5 fig, 4 tab, 8 ref.

Descriptors: *Water resources development, *United States, *Cost-benefit analysis, *Water storage, *Reservoirs, Water yield, Runoff, Safe yield, Planning, Low-flow augmentation, Water supply, Probability, Reservoir yield, Reservoir storage.

With no storage, the supply of surface water available in conterminous United States would be only 8% of the average annual runoff, whereas if one-half of the existing storage capacity were used to augment low flow, 23% of the average annual runoff would be available throughout all but 2% of the years. If all the existing storage capacity were so used, 34% of the average annual runoff would be available, and with unlimited storage capacity 86% would be available. The other 14% would be evaporated from the 3.5 billion acre-ft of storage that would be required to regulate the flow. For water worth $0.05 per 1,000 gal, development of 80% of the average annual runoff of conterminous United States would be economically justified. In 10 of the 17 water resources regions of conterminous United States, development of surface water resources is less than one-half of the potential development. (Knapp-USGS)
W72-14217

MOVING WATER TABLES IN TILE-DRAINED SOILS,
West Pakistan Univ. of Engineering and Technology, Lahore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W72-14218

NAVIGATION OF THE KANSAS RIVER, LAWRENCE TO THE MOUTH (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available in the National Technical Information Service as PB-209 050-D, $4.50 in paper copy. May 10, 1972. 36 p, 1 map.

Descriptors: *Kansas, *Environmental effects, *Dredging, *River training, Bank stabilization, Project planning, Project feasibility, Barges, Project benefits, River regulation, Navigation, Navigable rivers, Transportation, Industries, Fisheries, Feasibility, Water control, Water resources development, Benthic flora, Benthic fauna, Stream fisheries, Turbidity, Spoil banks, Maintenance.
Identifiers: *Environmental impact statement, *Lawrence (Kan).

The proposed harbor navigation project on the Kansas River from Lawrence to the mouth includes training, bank stabilization and dredging. The project will provide transportation on the Kansas River for barges loaded for Missouri River transport. The project will be 9.3 miles long with a channel width of 150 feet and a depth of 9 feet. Dredged material will be placed behind the dikes. Adverse environmental impacts of the project include destruction of benthic organisms and disruption of fisheries, rapid industrial development especially in areas requiring barge transportation, increased turbidity caused by dredging and powerboat traffic, and increased chances of accidental spills, leaks, and other discharges associated with commercial navigation. Spills would remain in the area for extended periods because of the slow current. Varying the lengths of the river channel proved unfeasible as did other alternatives. Several alternatives were considered. Construction of pipelines would restrict industrial diversity. Increased flow from lakes was judged unavoidable. Dredging the channel only proved unsatisfactory. Regulation by dikes and revetments would be possible, however the character of the river would be altered and the floodway capacity reduced. No action would result in loss of opportunities to encourage more rapid industrial expansion. The proposed project is designed to service existing industry and its potential for expansion. (Ellis-Florida)
W72-14260

SMALL BOAT HARBOR, PORTSMOUTH STATE PARK, OHIO, OHIO RIVER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-198 883-F. 3.00 in paper copy. July 7, 1971. 32 p, 1 map, 11 tab.

Descriptors: *Ohio, *Recreation, *Environmental effects, *Dredging, Harbors, Ohio River, Recreation demand, Basins, Ecology, Boats, Boating, Boat-launching ramps, Benefits, Costs, Feasibility, Habitats, Water sports, Water utilization, Flood plains, Fishing, Turbidity, Excavation, Oil spills.
Identifiers: *Environmental impact statement, *Portsmouth State Park (Ohio).

The proposed project consists primarily of developing a harbor adjacent to the Ohio River in Scioto County about seven miles southwest of Portsmouth, Ohio, to provide docking and berthing facilities for recreational boats. The harbor will be created by enlarging Nace Run by excavating the low-lying flood plain at the confluence of the streams. Facilities for recreational boating in the area are presently inadequate. Some low, frequently flooded areas will be raised, thereby improving the area for development as a state park. The concentration of the boats will create a potential for oil and fuel pollution from spills and normal boating. Unavoidable adverse environmental effects include disruption of the ecosystem due to the removal of some vegetation, the excavation of the harbor, the minor filling of low-lying areas, and the resulting temporary increase in turbidity during construction will be in large part unavoidable. The usual secondary effects of land development can also be anticipated. Foregoing improvement would leave unabated the existing shortage of facilities. No feasible alternative sites are readily available. No irretrievable commitment of resources will be involved other than the labor and materials for construction, maintenance, and operation. (Ellis-Florida)
W72-14261

SCITUATE HARBOR, SCITUATE MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-202 804-F. $3.00 in paper copy. November 1971. 24 p, 3 fig.

Descriptors: *Massachusetts, *Harbors, *Dredging, *Environmental effects, Navigation, Recreation, Recreation demand, Basins, Channel improvement, Shellfish, Ecology, Boats, Boat-launching ramps, Benefits, Costs, Feasibility, Habitats, Water sports, Water utilization, Boating, Turbidity, Disposal.
Identifiers: *Environmental impact statement, *Scituate (Mass.), Coastal waters.

The proposed navigation project in Scituate Harbor, a natural cove in Massachusetts Bay, consists of constructing three mooring basins to a depth six feet below mean low water. The improvement is designed to alleviate crowded conditions experienced and to allow for future growth in the number of boats utilizing the harbor. Approximately 300,000 cubic yards of material will be dredged and dumped into the bay. The proposed dredging will adversely affect many life forms in the area. However, the effects should be temporary as the inhabitants will quickly recolonize the area and reestablish the ecological balance now present. A loss of harvestable shellfish will occur in one mooring basin which is to be dredged. An improved channel and mooring facilities would alleviate the present navigational problems. However, the potentiality for such problems as untreated sewage, oil, and garbage discharges will be increased. An alternative to the project would be the development of onshore boat launch and parking facilities which would destroy valuable natural areas and limit the boat size to those trailerable. Foregoing any improvement would not solve existing navigation problems nor would it allow growth. The project should have no adverse effects on the long-term productivity of the area in terms of fish and wildlife resources. (See also W72-14264). (Ellis-Florida)
W72-14263

MAINTENANCE DREDGING, SCITUATE HARBOR, MASSACHUSETTS (DRAFT ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-209 044-D. $3.25 in paper copy, $0.95 in microfiche. April 10, 1972. 18 p, 2 map, 1 tab, 6 ref.

Descriptors: *Massachusetts, *Environmental effects, *Navigation, *Dredging, Harbors, Water resources development, Turbidity, Sediments, Ships, Project benefits, Project purposes, Excavation, Spoil banks, Water pollution, Water pollution control, Fish, Biochemical oxygen demand, Chemical oxygen demand, Aquatic environment, Nitrogen compounds, Water quality.
Identifiers: *Environmental impact statement, *Scituate Harbor (Mass), Coastal waters.

This project consists of periodic maintenance dredging of Scituate Harbor, Massachusetts, to remove approximately 145,000 cubic yards of material from the federal navigation project within the harbor. The dredging will maintain the channels and anchorage basins of dimensions suited for safe navigation and mooring. The harbor is a natural cove designated by the Coast Guard as a harbor of refuge. No permanent adverse effects on fish and wildlife resources of the harbor will result from dredging, although there will be an increase in turbidity and in the biochemical and chemical oxygen demand in the water column. Upheaval of sediments might also release large enough amounts of nitrogen compounds to have some consequences on some marine organisms. The dredging and spoiling may cause some temporary environmental stresses on the associated marine biota but no persistent detriments are expected to result. Dredging may also cause some temporary adversities to the surrounding tidal marshes. No alternatives to the maintenance work other than a status quo situation are seen. An alternative to offshore spoil disposal would be onshore disposal. However, limited land availability poses a problem as well as the putrid smell of the sediments. (See also W72-14263). (Brackins-Florida)
W72-14264

CHOWAN RIVER, NORTH CAROLINA, BLACKWATER RIVER, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 08D.
W72-14266

BIG CREEK AND TRIBUTARIES, LOWER WHITE RIVER BASIN, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.

Available from the National Technical Information Service as PB-200 789-D. $3.00 in paper copy. July 8, 1971. 12 p, 1 map.

Descriptors: *Arkansas, *Environmental effects, *Channel improvement, *Flood control, Wildlife habitats, Flood protection, Stream stabilization, Channels, Surface drainage, Drainage engineering, Drainage effects, Turbidity, Fishing, Sedimentation, Dam construction, Stream beds, Stream fisheries, Aesthetics, Land clearing.
Identifiers: *Environmental impact statement, *Big Creek, Tenn., *White River Basin.

The planned project involves straightening, enlarging, and cleaning out the Big Creek channel for a distance of 68 miles from its mouth. Additionally work is planned for 46 miles of the upstream tributary of Big Creek. Big Creek rises in St. Francis County, Arkansas, and flows southwesterly to its confluence with White River. The project is designed to reduce flooding, reduce sedimentation, and improve drainage. Structural measures also include a series of low dams in the stream channel. The project will enhance the human environment by reducing flooding. Approximately 1600 acres of woodland habitat will be cleared for the project. Adverse environmental impacts include: reduced fishery values caused by turbidity, rapidly fluctuating stream flow, lack of deep water pools, and removal of stream side cover; loss of aesthetic value of the natural streambed; and reduced game resources resulting from clearing. Alternatives which were considered include: complete abandonment of the project, construction of floodwater retention structures, development of a levied flood plain, and flood plain zoning in the absence of channel improvement. Resource commitments to the project are neither irreversible nor irretrievable in the sense that if the project were not maintained pre-project environmental conditions would be gradually restored. (Grant-Florida)
W72-14267

BLACK ROCK CHANNEL AND TONAWANDA HARBOR, NEW YORK (OPERATION AND MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

For primary bibliographic entry see Field 05G.
W72-14272

ROCHESTER HARBOR, MONROE COUNTY, NEW YORK (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14273

ZUMBRO RIVER, MINNESOTA, KELLOGG TO MOUTH, WABASHA COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 08D.
W72-14274

SMALL NAVIGATION PROJECT, ANDREWS RIVER, HARWICH, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-202 919-F. $3.00 in paper copy. September 8, 1971. 24 p, 1 map, 1 tab.

Descriptors: *Massachusetts, *Navigation, *Jetties, *Environmental effects, Channel improvement, Harbors, Shore protection, Shoals, Coasts, Geomorphology, Shallow water, Turbidity, Fish habitats, Fisheries, Commercial fishing, Boating, Recreation, Dredging, Benthic fauna, Benthic flora.
Identifiers: *Environmental impact statement, *Cape Cod, *Andrews River (Mass), *Harwich Harbor (Mass).

The proposed project would involve construction of a jetty on the west side of the entrance to the Andrews River in order to prevent serious shoaling and erosion and provide navigation protection to Harwich Harbor. The project is part of the Harwich Harbor project, most of which is complete. Redredging will be necessary to restore the harbor entrance to its federally authorized depth. The Andrews River is a tidal river located on the southern side of Cape Cod. There is some fishing in the river, but no shellfish of significance. Environmental effects of the project include: shoaling in the entrance channel and on the beach west of the jetty, less frequent maintenance dredging will be needed, short-term turbidity during construction, elimination of benthic organism in the construction area, and safer boating. Pollution from boats will increase, however. No adverse environmental effects are anticipated at this time, however, the project may adversely affect commercial fish which use the area during adult or juvenile stages. The only alternative is to refrain from constructing the jetty in which case continual maintenance dredging will be needed to keep the harbor entrance navigable. (Grant-Florida)
W72-14276

NEW BEDFORD AND FAIRHAVEN HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-203 156F, $3.00 in paper copy. July 13, 1971. 25 p, 1 map, 5 tab.

Descriptors: *Connecticut, *Navigation, *Channel improvement, *Environmental effects, Recreation, Boating, Spoil banks, Commercial fishing, Marine fisheries, Shellfish, Shores, Silting, Turbidity, Odor, Water pollution effects, Aquatic habitats, Wildlife habitats, Salt marshes, Dredging.
Identifiers: *Environmental impact statement, *Fairhaven Harbor, Mass., *New Bedford Channel (Mass).

The proposed navigation project for New Bedford and Fairhaven Harbor, Connecticut, consists of channel improvements designed to aid navigation by eliminating the possibility of vessel groundings and making the channel navigable for commercial and recreational craft. Approximately 75,000 cubic yards of silt and sand will have to be dredged and disposed. The following environmental impacts are anticipated: temporary silting during construction, temporary odor in the project area during construction due to release of gases from disturbed bottom soil, and temporary turbidity during construction. No adverse effects are anticipated to occur to the fish population in the improved channel areas. Adverse effects include: temporary silting, turbidity, and offensive odors; adverse effects on fish and wildlife in the spoil area due to pollutants in the spoil; and loss of shellfish habitat and marshland if spoil is dumped onshore. Alternatives considered include a larger project, which was found to not have any greater benefits. If the project is not undertaken commercial fishing and navigation would remain dangerous and recreational boating would be safe only at higher tides. (Grant-Florida)
W72-14277

DOG RIVER, MOBILE BAY, ALABAMA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as PB-206 176-F, $3.00 in paper copy. September 15, 1971. 45 p, 1 map, 6 tab.

Descriptors: *Alabama, *Navigation, *Channel improvement, *Environmental effects, Wildlife habitats, Aquatic habitats, Estuarine environment, Saline water fish, Estuarine fisheries, Inflow, Mixing, Bays, Dredging, Turbidity, Fish conservation, Disposal, Spoil banks, Boating, Recreation, Commercial fishing.
Identifiers: *Environmental impact statement, *Mobile Bay (Ala), *Dog River (Ala).

The proposed project will involve the dredging of an 8 by 150 feet channel from 3,000 feet east of the Mobile Bay Ship Channel to and up Dog River for a distance of 26,200 feet. Spoil will be placed in designated areas along the banks and in open water of the bay. The project is designed to satisfy increased commercial and recreational navigation needs on the Dog River. Environmental impacts of the proposed project include: alteration of 104 acres of water bottom and 30 acres of marshland used as a disposal site; lessened chances of fish-kills since channel improvement will increase salt water flow and increase dissolved oxygen content; and conversion of former upstream freshwater areas to estuarine habitats. Adverse impacts include: increased siltation and turbidity in the project area, short-term disruption of channel bottom fauna, partial loss of marshland habitats from spoil dumping, and a shift in fish population caused by the influx of salt water upstream. Alternatives to the proposed project include: no construction, placing all spoil on fast land, and variations in channel depths. (Grant-Florida)
W72-14279

OPTIMUM RESERVOIR OPERATION USING STOCHASTIC DYNAMIC PROGRAMMING,
Nevada Univ., Reno. Center for Water Resources Research.
W. S. Butcher, and J. W. Fordham.
Available from the National Technical Information Service as PB-212 146, $3.00 in paper copy, $0.95 in microfiche. Technical Report Series H-W, Hydrology and Water Resources Publication No 9, September 1970. 48 p, 10 fig, 7 tab, 48 ref, 2 append. OWWR C-1919 (3179) (2).
Descriptors: *Reservoir operations, *Model studies, *Systems analysis, *Computer programs, *Stochastic processes, Optimization, Statistical models, Hydrologic data, Streamflow, Regression analysis, Water utilization, Hydrologic budget, Streamflow forecasting.

An optimal operating policy for a multipurpose reservoir was determined, where the optimal operating policy is stated in terms of the state of the reservoir indicated by the storage volume and the river flow in the preceding month and uses a stochastic dynamic programming approach. Such a policy could be implemented in real time operation on a monthly basis or it could be used in a design study. As contrasted with deterministic dynamic programming, this method avoids the artificiality of using a single set of stream flows. The data are the conditional probabilities of the stream flow in successive months, the physical features of the reservoir in question, and the return functions and constraints under which the system operates. (Woodard-USGS)
W72-14347

THE EFFECTS OF RAINFALL INTENSITY, PAVEMENT CROSS SLOPE, SURFACE TEXTURE, AND DRAINAGE LENGTH ON PAVEMENT WATER DEPTHS,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 04C.
W72-14360

TRANSPORTABLE BREAKWATERS-A SURVEY OF CONCEPTS,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08A.
W72-14361

NATIONAL ENGINEERING HANDBOOK, SECTION 2-ENGINEERING PRACTICE STANDARDS: PART 1, ENGINEERING CONSERVATION PRACTICES.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08D.
W72-14364

DEADLY SURGES IN THE BAY OF BENGAL: DYNAMICS AND STORM-TIDE TABLES,
Harvard Univ., Cambridge, Mass, Earth and Planetary Physics Center.
For primary bibliographic entry see Field 02A.
W72-14367

RESULTS OF HYDRAULIC AND SHOALING STUDIES IN MARCUS HOOK-SCHUYLKILL REACH OF DELAWARE RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14370

THE 1969 UPPER MISSISSIPPI RIVER DREDGE SPOIL SURVEY FROM HASTINGS, MINNESOTA TO CAIRO, ILLINOIS,
Missouri Dept. of Conservation, Jefferson City.
For primary bibliographic entry see Field 05G.
W72-14374

STUDIES ON OYSTER CULTIVATION IN THE DRAINAGE BASIN OF OSTEND (BELGIUM) DURING 1969,
Institut Royal des Sciences Naturelles de Belgique, (Belgium).
E. Leloup.
Bull Inst R Sci Nat Belg. Vol 47, No 25, p 1-16. 1971. Illus.
Identifiers: Belgium, Carcinus maenas, Cardium edule, Codium tomentosum, Crassostrea gigas, Crepidula fornicata, Enteromorpha compressa,

Nassa reticulata, *Ostend, Ostrea edulis, *Oysters, Ulva lactuca, *Shellfish farming.

The basin floor was covered with the thallae of Ulva lactuca (green algae, sea lettuce) and Enteromorpha compressa, as well as Codium tomentosum. Dredging operations were done to correct this condition. Tons of Nassa reticulata (bivalve molluscs) were dumped into the bay to destroy the vegetation. This treatment was successful with most of the algae. The period April-Oct. 1969 was propitious for reproduction of organisms. Regular commercial bars were used, made of teakwood and weighing 15-20 lbs. On 21 Aug. 50 fixed oysters, 135 Mya, 71 mussels, 35 Crepidulae and 1 young oyster were found attached to the average 'baton'. The fauna attached to 'batons' by Sept. 18 included sponges, Bryozoa, Polydora and Amphipoda. Another device used for oyster production was the 'Japanese basket'. Results with the oyster, Ostrea edulis are reported in detail for size, whether attached to 'batons,' bottom or Japanese basket. Similar information is given for Crepidula fornicata, Cardium edule, Carcinus maenas and Crassostrea gigas.--Copyright 1972, Biological Abstracts, Inc.
W72-14378

OPTIMUM OPERATIONS MODEL FOR SHASTA-TRINITY SYSTEM,
Bureau of Reclamation, Sacramento, Calif. Water and Power Control Division.
D. M. Fults, and L. F. Hancock.
Journal of the Hydraulics Division, Proceedings, American Society of Civil Engineers, Vol 98, No HY9, Proceedings paper 9176, p 1497-1514, Septen.ber 1972. 5 fig, 1 tab, 3 ref, 2 append.

Descriptors: *Central Valley project, *California, *River systems, Operation and maintenance, *Reservoirs, River basins, *Dynamic programming, *Optimization, Simulation analysis, Digital computers, Computer models, Constraints, Forecasting, Scheduling, Dams, Powerplants, Reservoir releases, Flood control, Multiple-purpose projects, Reservoir storage, Decision making, Operations research.
Identifiers: *Sacramento River, *Trinity River, Keswick reservoir, *Shasta reservoir, Shasta dam, Shasta-Trinity system.

A mathematical model is presented for optimizing water and power operations on a daily basis over a 30-day period for the northern portion of the Central Valley Project in California. The model uses state incremental dynamic programming to determine the daily optimum policy for the Shasta-Trinity Division of the project. This is a method of solving optimization problems which lead to an iterative functional equation that can be solved on a digital computer. Continuity and flood control are embodied in the model by simulation. The basic equations and constraints describing the Shasta-Trinity system are presented. The dynamic programming model and the FORTRAN IV computer program are described in detail, and application of the model in the project's real world environment is discussed. The model selects the operating strategy which maximizes electrical energy generation while satisfying firm water contracts, mandatory releases, and flood control commitments. Model input consists of deterministic streamflow, storage, electrical, and precipitation data. Up to now, operating policy for the project was solely computer simulation of the system and selection of the best operating strategy from several trials. But the recent need to operate the project more efficiently has led to the development and inclusion of the optimizing technique described herein. (Bell-Cornell)
W72-14384

RIVER DEE RESEARCH PROGRAM: 1. OPERATING MULTIPURPOSE RESERVOIR SYSTEMS FOR WATER SUPPLY AND FLOOD ALLEVIATION,
Water Resources Board, Reading (England).
D. G. Jamieson.
Water Resources Research, Vol 8, No 4, p 899-903, August 1972. 2 fig, 3 ref.

Descriptors: *Reservoir operation, *Multiple-purpose reservoirs, *Water supply, *Flood control, Optimization, Mathematical models, Systems analysis, Reservoir storage, River basin development, Computers, Simulation analysis.
Identifiers: *River Dee system, *Wales, *Retention levels, Direct supply reservoirs, Llyn Clen reservoir, Llyn Tegin reservoir.

The control policies for two of the most common purposes of multipurpose reservoirs, water supply and flood alleviation, are diametrically opposed. For water supply, reservoirs need to be kept as full as possible; for flood alleviation they should remain as empty as possible. Apportioning the available reservoir storage between these interests requires a compromise control policy. The lack of a suitable basis for deriving a single optimizing criterion has led to the use of a 'satisficing' model in which priority is given to water supply; rules are then formulated to optimize the operation of the reservoirs with respect to the secondary purpose, flood alleviation, provided the primary purpose of water supply is fulfilled to a predetermined standard. The resulting control policy, consisting of two interdependent control strategies, is described in detail and its application to the River Dee system in Wales is discussed. (See also W72-14387 and W72-14388) (Bell-Cornell)
W72-14386

RIVER DEE RESEARCH PROGRAM: 2. A LONG-TERM CONTROL STRATEGY FOR A MULTIPURPOSE RESERVOIR,
Lancaster Univ. Baillrigg (England).
J. C. Wilkinson.
Water Resources Research, Vol 8, No 4, p 904-910, August 1972. 5 fig, 2 ref.

Descriptors: *Reservoir operation, *Multiple-purpose reservoirs, *Water supply, *Flood control, Optimization, Mathematical models, Systems analysis, Reservoir storage, Water shortage, River basin development.
Identifiers: *River Dee system, Flood alleviation, *Retention levels, *Wales, Llyn Clen reservoir, Llyn Tegin reservoir.

The control policies for two of the most common purposes of multipurpose reservoirs, water supply and flood alleviation, are diametrically opposed. A 'satisficing' approach is applied to the River Dee system in Wales, whereby the water supply function is given priority over the subsidiary function of flood alleviation. Consideration is given to the secondary function provided that the primary function of water supply can be fulfilled to a predetermined standard. The resulting control policy consists of two interdependent control strategies, a long-term and a short-term strategy. The purpose of the long-term control strategy is to define retention levels for a multipurpose reservoir that permit maximum storage to be available for flood alleviation subject to shortages in its water supply function occurring with a specified tolerable frequency. A recursive relationship is derived to calculate the probability of no shortage occurring within a chosen interval of time for any given set of retention levels. This relationship is used in conjunction with an iterative search procedure that finds the optimal set of minimum retention levels necessary to meet a given demand with a specified acceptable frequency of failure, and thereby as much storage as possible is allowed for flood alleviation. (See also W72-14386 and W72-14388) (Bell-Cornell)
W72-14387

RIVER DEE RESEARCH PROGRAM: 3. A SHORT-TERM CONTROL STRATEGY FOR MULTIPURPOSE RESERVOIR SYSTEMS,
Water Resources Board, Reading (England).
D. G. Jamieson, and J. C. Wilkinson.
Water Resources Research, Vol 8, No 4, p 911-920, August 1972. 2 fig, 11 ref.

Descriptors: *Reservoir operation, *Multiple-purpose reservoirs, *Flood control, *Water supply, *Digital computers, *Simulation analysis, *Dynamic programming, Hydrologic data, Optimization, Hydrographs, Hydrologic systems, Forecasting, Runoff, Rainfall, *Telemetry, Low flow, High flow, Reservoir storage, Mathematical models, Systems analysis, River basin development.
Identifiers: *River Dee system, *Wales, *Retention levels, Flood alleviation, Llyn Clen reservoir, Llyn Tegin reservoir.

With the primary purpose of water supply being fulfilled to a specified tolerable frequency of occurrence of shortages, attention can be turned to optimizing the operation of multipurpose reservoirs for the secondary purpose of flood alleviation. The short-term control strategy is confined to a time horizon of a few days. Its main purpose is to define the optimal releases from the reservoirs hour by hour. An automated control strategy has been developed for the short-term operation of multipurpose reservoir systems that will act as the basis for on-line processing of data obtained from a sophisticated telemetry scheme. The action of the computer is (1) to interrogate the outstations via the telemetry scheme to establish the existing state of the water resource system, (2) to forecast the future state of the system, and (3) to decide the optimal releases from the multipurpose reservoirs. The real-time forecasting stage uses digital simulation, and the decision-making stage is based on a dynamic programming formulation. The short-term control strategy is not confined to flood alleviation but operates continually over the complete range of flows. Its application to the River Dee system in Wales is described in detail. (See also W72-14386 and W72-14387) (Bell-Cornell)
W72-14388

METHODS FOR PREDICTING URBAN DRAINAGE COSTS,
Agriculture Research Service, Boise, Idaho. Soil and Water Conservation Research Div.
W. J. Rawls, and J. W. Knapp.
Journal of the Hydraulics Division, Proceedings, American Society of Civil Engineers, Vol 98, No HY9, Proceedings paper 9206, p 1575-1585, September 1972. 5 tab, 10 ref.

Descriptors: *Urban drainage, *Costs, *Economic analysis, Equations, *Design criteria, Urbanization, Sewers, Storms, Drainage area, Planning, Rainfall, Land use, Mathematical models, Systems analysis.
Identifiers: Physical characteristics, *Cost prediction, Ground slope, Storm magnitude, Storm frequency.

The purpose of this study is to define the significant variables that determine the costs of urban drainage facilities and to develop equations for predicting their costs. Examination of more than 100 small urban drainage systems reveals that investment in conventional drainage systems depends upon design factors and physical characteristics of the drainage area. The most significant cost components are: average slope of the drainage area; smallest diameter of pipe; number of inlets and manholes; storm frequency; runoff coefficient; total capacity; and total developed area. Regression, multivariant, and nonlinear modelling techniques are used to explain differences in design methods and to develop cost prediction equations for various levels of design. Such time-saving prediction models will enable

agencies such as the Federal Housing Administration, municipal and regional planning commissions, and engineering offices to judge design cost alternatives rapidly and reasonably accurately, and choices will be able to be based upon public desires and planning objectives for land use and development. (Bell-Cornell)
W72-14390

PREDICTION OF COLUMBIA RIVER TEMPERATURES DOWNSTREAM FROM GRAND COULEE DAM FOR WIDE EXTREMES OF FLOW AND WEATHER CONDITIONS,
R. T. Jaske.
Pacific Northwest Laboratories, Battelle Memorial Institute, Richland, Washington, September 1965. 19 p, 8 fig, 5 ref.

Descriptors: *Water temperature, *Impoundments, *Computer models, *Grand Coulee Dam, Dams, Evaluation, Weather, Flow, Discharge, Heat budget, Water measurement, *Columbia River, Water resources development, Dam construction, Model studies.

The Columbia River environment was simulated by using a computer model and evaluating the effects of the annual Columbia River cooling program. The results pointed out the importance of estimating effects of the Canadian Treaty impoundments and resulting operational plans on the future thermal conditions in the Columbia River. The shift of warm water temperatures of the summer to later in the fall during and after construction of Grand Coulee Dam was illustrated. It was speculated that the peak discharge temperature from Lake Roosevelt after the Columbia Treaty dams are built could shift to late November. Recommendations were made for establishing stations for recording of water conditions at the international border and at a point below Grand Coulee Dam and for developing a computer program flexible enough for various reservoirs. (Hsieh-Vanderbilt)
W72-14402

PREDICTING QUALITY EFFECTS OF PUMPED STORAGE,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 05C.
W72-14405

EFFECT OF SIZE OF RESERVOIR ON HYDRO PROJECT COST,
National Technical Univ., Athens (Greece); and Public Power Corp., Athens (Greece).
For primary bibliographic entry see Field 06C.
W72-14419

VACATION HOME LOCATION: A MODEL FOR SIMULATING THE RESIDENTIAL DEVELOPMENT OF RURAL RECREATION AREAS,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 06B.
W72-14425

RIPRAP STABILITY ON EARTH EMBANKMENTS TESTED IN LARGE AND SMALL SCALE WAVE TANKS,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08B.
W72-14427

SOME PROBLEMS WITH LOG-NORMAL MARKOV RUNOFF MODELS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14520

TECHNIQUES OF EVALUATING EFFECTS OF WATER ON DRAINAGE STRUCTURES IN ALABAMA,
Geological Survey of Alabama, Montgomery. Water Resources Div.
For primary bibliographic entry see Field 08G.
W72-14522

SCL SPONSORED 'EXCURSION' INTO FORESTRY, ECOLOGY, AND NATURAL RESOURCES IN SOUTH CAROLINA,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14547

EVERGLADES-BIG CYPRESS NATIONAL RECREATION AREA.
For primary bibliographic entry see Field 06B.
W72-14556

PUGET SOUND AND ADJACENT WATERS COMPREHENSIVE PLAN (DRAFT ENVIRONMENTAL STATEMENT).
Pacific Northwest River Basins Commission, Vancouver, Wash.
For primary bibliographic entry see Field 06G.
W72-14558

LEVEE AND DRAINAGE MODIFICATIONS SCAPPOOSE DRAINAGE DISTRICT; COLUMBIA RIVER, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 04D.
W72-14560

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK AT AND IN THE VICINITY OF BREWSTER, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 08D.
W72-14567

MUD MOUNTAIN DAM AND RESERVOIR, WHITE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08D.
W72-14570

SCITUATE HARBOR, SCITUATE, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-202 804D. $3.00 in paper copy, $0.95 in microfiche. August 3, 1971. 6 p.

Descriptors: *Environmental effects, *Dredging, *Harbors, *Marinas, Turbidity, Excavation, Spoil banks, Navigation, Recreation, Project benefits, Project purposes, Aquatic environment, Water quality, Water pollution, Shellfish, Channel improvement, Massachusetts, Boating.
Identifiers: *Environmental Impact Statements, *Scituate (Mass).

The project would consist of harbor improvement through the removal and disposal of about 300,000 cubic yards of material from thirty-two acres. The proposed project is designed to alleviate crowded conditions and to allow for future growth. Major features of the proposed improvement are three mooring basins. The dredging operation will create a temporary turbid condition in the project area. Prior to dumping of the spoil material, it will be subject to tests to check conformity with water quality standards. The spoil would be similar to the bottom already present at the disposal site, therefore, the bottom dwellers would repopulate the area in time. The loss of small shellfish area will be another adverse effect. The project would enhance the short-term use and increase the long-term productivity of the harbor without a loss of fish and wildlife production in the area. The only alternative considered was the development of another boat launch facility. (Brackins-Florida)
W72-14572

ANACOSTIA RIVER AND TRIBUTARIES, PRINCE GEORGES COUNTY, MARYLAND, LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.

Available from the National Technical Information Service as PB-200 797F. $3.00 in paper copy, $0.95 in microfiche. September 15, 1971. 85 p, 2 map, 3 tab.

Descriptors: *Maryland, *environmental effects, *Flood control, *Channel improvement, District of Columbia, Aquatic environment, Biological communities, Stream improvement, Wildlife habitats, Tributaries, Non-structural alternatives, Water resources development, Flood protection, Aesthetics, Turbidity, Sedimentation, Sediment control, Urbanization, Area redevelopment.
Identifiers: *Prince Georges County (Md), *Environmental Impact Statements, Anacostia River Project.

The project calls for widening, deepening, and realigning approximately 20,410 feet of the Anacostia River and its tributaries. The Anacostia River study area is part of the greater Metropolitan Washington statistical region. The proposed project will result in a reduction of flood damages but there will also be a reduction of natural biological productivity. Sections of some of the streams support a variety of aquatic, insect, and animal life. In developing the Anacostia River for flood control, many of these natural values along the Paint Branch and Indian Creek reaches will be lost. Before deciding on the present project, several other solutions were considered: reservoirs, evacuation of the flood plain, channel improvement, diversion, levees, and no development. It is the feeling of local residents that the long-term growth and aesthetic potential of the area is being adversely affected by the flooding, and that it is in the best interests of the area to prevent flood damage in the future. The most obvious resources involved will be the commitment of the labor, material, and financial resources associated with construction. (Waldron-Florida)
W72-14574

DUCK RIVER PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Science.
For primary bibliographic entry see Field 08A.
W72-14575

TILLAGE AND HERBICIDES FOR SURFACE RESIDUE MAINTENANCE, WEED CONTROL, AND WATER CONSERVATION,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 03F.
W72-14577

THE PRACTICAL APPLICATION OF DYNAMIC PROGRAMMING TO RESERVOIR SYSTEMS WITH PUMPED INPUTS,
Water Research Association, Medmenham (England).

D. G. Thorn, and P. A. Mawer.
Presented at First Symposium on Water Resources Systems, Karlovy Vary, Czechoslavakia, May 1972. 12 p, 6 fig, 2 ref.

Descriptors: *Reservoir operation, *Pumped storage, *Reservoirs, *Operating costs, *Dynamic programming, Optimization, Algorithms, Long-term planning, Multiple-purpose reservoirs, River regulation, Recreation water supply, Pumps, Constraints, Storage, Electricity, Mathematical models, Systems analysis, Simulation analysis.
Identifiers: *Control rules, *Electrically driven pumps, *Operating rules.

Described is a method for deriving control rules that minimize long term operating costs of a pumped storage reservoir. A common control rule is to keep the reservoir as full as possible, pumping water from the river whenever there is space in the reservoir and the river flow allows. However, since unit pumping costs generally vary with both source and pumping rate, the above simple control is not optimal. Thus, the only way the long term running costs of such a system can be minimized, subject to reliability and amenity constraints, is to derive a control rule that specifies, for each reservoir state and time of year, which sources to be used and the corresponding maximum pumping rates to be employed. The technique described here utilizes dynamic programming and simulation. Computational refinements are given that result in an efficient dynamic programming algorithm. Cited is an example of a multipurpose reservoir supplied from two rivers by electronically driven pumps and used for river regulation, recreation and water supply. (Bell-Cornell)
W72-14646

MARSELLE-FOS: THE EQUIPMENT FOR A SEA SHORE; THE STABILITY TO PRESERVE, (MARSEILLE-FOS: L'EQUIPMENT D'UNE FACADE MARITIME; LES EQUILIBRES A PRE-SERVER),
Port Autonome de Marseille (France).
For primary bibliographic entry see Field 05G.
W72-14652

FILAMENTOUS ALGAE AS WEEDS,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-14692

NATURAL REGENERATION OF THE KAMBUI HILLS FOREST IN EASTERN SIERRA LEONE: I. ECOLOGICAL STATUS OF THE LOPHIRA/HERITIERA RAIN FOREST,
Forestry Dept., Sandakan (Malaysia). Research Branch.
J. E. D. Fox.
Trop Ecol. Vol 11, No 2, p 169-185. 1970. Illus.
Identifiers: *Rain forests, Ecology, Forests, Heritiera d, Lophira d, Regeneration, *Sierra Leone, Status.

The rain forest of the Kambui Hills, Sierra Leone is discussed in relation to West African rainforest generally. This area is under intensive forest management and in an attempt to prepare the ground for a discussion of silviculture and results of silvicultural, its ecological status is described. Of the various factors influencing forests it is considered that past shifting cultivation is probably the most important in the area described. Representative enumeration data and profile descriptions are presented.--Copyright 1972, Biological Abstracts, Inc.
W72-14696

ADAIR IHD EXPERIMENTAL BASIN NO 14, 1970.
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
New Zealand Ministry of Works Hydrological Research Annual Report No 21, 1971. 6 p, 3 fig, append.

Descriptors: *Soil-water-plant relationships, *Hydrologic systems, *Demonstration watersheds, *Land management, *Pasture management, Foreign research, Vegetation, Grasses, Sheep, Soil conservation, Rainfall.
Identifiers: *New Zealand (Adair), Experimental basin.

Under the auspices of the International Hydrological Decade the Ministry of Works is establishing a network of experimental basins to study the hydrological characteristics of important soil and vegetation complexes of New Zealand. The study of the effect of cultural change on these characteristics is included. This is the second annual research report for Adair, and it describes the hydrologic system constructed in 1970. Following completion of the collecting channels in April, all pasture damaged during construction was re-sown. This involved a 3-4 meter strip of land immediately above the collecting channels in each catchment. Apart from maintaining rainfall totals, no analysis of data collected was made during the period. The precipitation for the period was 499 mm. The long-term mean annual precipitation for the area is 609 mm. (Woodard-USGS)
W72-14729

ILLINOIS LAWS RELATING TO WATERWAYS, 1971.
Illinois State Div. of Waterways, Springfield, Ill.

(1972). 185 p.

Descriptors: *Illinois, *Watercourses (Legal aspects), *Water law, *Legislation, Legal aspects, State governements, Local governments, Regulation, Water resources, Transportation, Navigation, Great Lakes Region, Lake Michigan, Flood control, Drainage, Port authorities, Interstate compacts, Navigable rivers, Water conservation, Environmental sanitation.
Identifiers: *Illinois Waterway laws.

Included are both federal and Illinois state statutes dealing with the Illinois and Michigan Canal. State statutes create eleven local port authorities, including the Chicago Regional Port District. Also included are the following: an interstate compact dealing with the Mississippi River; legislation dealing with flood control, sanitation and navigable waterways; and legislation concerning water terminal facilities, submerged lands, the level of Lake Michigan and drainage. The Illinois Drainage Code is contained. Another act vests in the state Department of Transportation jurisdiction and supervision over all of the rivers and lakes in Illinois wherein the state or the public has any rights. The act encompasses navigation, encroachments on any waters and permits for taking materials from the beds of public waters. Also included are acts which create River Conservancy Districts, Water Authorities, a Natural Resources Development Board and Surface Water Protection Districts. (Brackins-Florida)
W72-14752

PUEBLO DAM AND RESERVOIR, FRYING-PAN-ARKANSAS PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo. Region 7.
For primary bibliographic entry see Field 08A.
W72-14753

SUGAR AND BRIAR CREEKS PROJECT, CATAWBA RIVER BASIN, NORTH CAROLINA AND SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
Available from the National Technical Information Service as PB-203 232-F, $3.00 in paper copy, $0.95 in microfiche. July 28, 1971. 29 p, 7 map.

Descriptors: *North Carolina, *Environmental effects, *Channel improvement, *Flood protection, *Natural streams, Flood control, Canals, Open channels, Canal embankments, Excavation, Hydrologic aspects, Recreation, Aesthetics, Streamflow, Stream improvement, Water quality control, Mosquitoes, Dredging.
Identifiers: *Environmental Impact Statements, *Charlotte (NC).

The Sugar and Briar Creeks Project is located in metropolitan Charlotte, North Carolina and is designed primarily to provide flood control in that metropolitan area. The project would involve channelization of the two creeks for a total of 7.6 miles. The canal varies in size from a 50 to 40 to 30 foot bottom width. Construction of the Briar Creek portion has been held in abeyance and the impact statement refers only to Little Sugar Creek. Environmental impacts include alteration of stream hydrology to reduce flood damage, elimination of mosquito breeding areas, enhanced water quality, and increased outdoor recreation potential. Unavoidable adverse impacts include temporary aesthetic effects due to construction and loss of natural stream beauty. Alternative courses of action considered include levied floodways, construction of an upstream reservoir, and no action. (Grant-Florida)
W72-14755

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-14757

BLUE SPRINGS LAKE, LITTLE BLUE RIVER LAKES, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-14759

JACKSONVILLE HARBOR, FLORIDA (SECTION I). NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-199 880-F, $3.00 in paper copy, $0.95 in microfiche. December 1971. 103 p, 1 map, 8 tab.

Descriptors: *Florida, *Channel improvement, *Navigation, *Environmental effects, Recreation, Oil spills, Dredging, Spoil banks, Navigable rivers, Water quality control, Aquatic life, Fish conservation, Shellfish, Shrimp, Turbidity, Runoff, Water pollution sources, Aquifers, Wildlife habitats, Harbors, Disposal.
Identifiers: *Environmental Impact Statements, Jacksonville Harbor (Fla).

The proposed project will involve enlarging the navigation channel in the St. Johns River at Jacksonville Harbor. The project will require maintenance dredging of the existing ocean entrance channel, deepening the existing 34-foot project channel to 38 feet to the vicinity of municipal docks, and widening the channel at two other locations. The channel length involved is about 22 miles. Approximately 11,700,000 cubic yards of material will be dredged. Environmental impacts include temporary turbidity during construction and turbidity adjacent to disposal sites, possible adverse effects to fish and shellfish populations, loss of vegetation and the habitat of the 614 acre upland disposal areas, some penetration of the shallow aquifer underlying the project area, and

beneficial use of filled areas for building construction and recreational development. Adverse impacts include displacement of animal populations in the disposal area, recurring disturbance from maintenance dredging, and increased opportunity for oil spills from expanded river traffic. Alternatives include variations in the scope of project work, in port operations, and in spoil disposal methods. (Grant-Florida)
W72-14760

MANITOWOC HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.

Available from the National Technical Information Service as PB-201 843-F, $3.00 in paper copy, $0.95 in microfiche. September 2, 1971. 27 p, 1 map, 4 tab.

Descriptors: *Wisconsin, *Channel improvement, *Environmental effects, *Navigation, Recreation, Boats, Dredging, Spoil banks, Navigable rivers, Water quality control, Dikes, Benthic fauna, Aquatic microorganisms, Lake Michigan, Turbidity, Runoff, Soil contamination, Disposal, Food chains.
Identifiers: *Environmental Impact Statements, *Manitowoc Harbor (Wis).

The proposed project, located on the west shore of Lake Michigan, 80 miles north of Milwaukee, involves extending the existing channel upstream in the Manitowoc River for a distance of 720 feet at a depth of 12 feet. The project will require dredging 27,000 cubic yards of bottom material. The channel improvement will be carried out by use of hydraulic dredges, and a land based diked disposal area will be utilized. Environmental impacts include disruption of the present bottom population, which has become increasingly characteristic of polluted waters; some temporary turbidity and sedimentation during construction; dredge spoil overflow into the river with a minimum retention period of 48 hours; and loss of some vegetative cover in the disposal area, although the site will eventually be converted into a park. Adverse impacts include temporary turbidity and destruction of the benthic community in the extended channel. Alternatives considered were limited to varying project dimensions, features, alignments, dredging methods, and disposal sites. (Grant-Florida)
W72-14761

MAINTENANCE OF THE WESTCHESTER CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-206 394-D, $3.00 in paper copy, $0.95 in microfiche. January 6, 1972. 8 p, 1 map.

Descriptors: *New York, *Environmental effects, *Dredging, *Channel improvement, Maintenance, Channels, Alternate planning, Water management (Applied), Spoil banks, Turbidity, Water pollution sources, Benthic flora, Benthic fauna, Aquatic habitats, Oil spills, Navigation, Ships, Waterfowl.
Identifiers: *Environmental Impact Statements, *Westchester Creek (NY), Bronx County (NY).

The project is a maintenance action consisting of dredging the existing federal channel in Westchester Creek, Bronx County, New York, to its authorized project dimensions. Spoil from the channel will be deposited in Eaton's Neck disposal area unless the contractor finds a suitable upland site and secures the approval of the landowners and concerned governmental agencies. The action will provide continued safe and economical use of the channel, thus yielding transportation savings, alleviating oil and chemical spills, and causing temporary turbidity and slight disruption to local marine life in the dredging area. Adverse effects of the project include the following: impaired water quality from spoiling dredged materials, short-term turbidity, alteration of the food chain due to disruption of benthic organisms, temporary noise pollution disturbing migratory birds, and aesthetic impairment from continued navigation. The only alternative is discontinuance of the project. The dredging operation will remove some of the bottom materials, and, if the benthic organisms cannot re-establish their original habitat, an irreversible commitment will have occurred. (Widman-Florida)
W72-14762

TESORO TANK FARM AND BARGE SLIP, JUNEAU, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as PB-206 579-D, $3.00 in paper copy, $0.95 in microfiche. January 1972. 62 p, 5 map, 2 tab, 16 ref, illus.

Descriptors: *Alaska, *Environmental effects, *Project planning, *Dredging, Administrative agencies, Water management (Applied), Water quality control, Stream improvement, Access routes, Pipelines, Planning, Wetlands, Aquatic habitats, Wildlife habitats, Oil spills, Water pollution sources, Navigation, Ships.
Identifiers: *Environmental Impact Statements, *Tesoro Tank Farm (Alaska), Juneau (Alaska).

The proposed plan of development involves the construction of a petroleum storage area, access road and pipelines, a barge slip and docking area, and dredging the Mendenhall River. The purpose is to supply aircraft, heating, and automobile fuels to the people of Juneau, Alaska. The environmental impacts resulting from the project can be categorized into three main headings: alteration of the river and wetlands, changes in land and water uses, and water quality. Present identifiable adverse effects include the following: loss of about five acres of wetland habitat and modification of at least another five acres of river habitat; alteration of river habitat from future dredging; precedent setting action for future wetlands development; potential for petroleum product spills and associated biological damage; and a decrease in the attractiveness of the area for waterfowl feeding, resting, and hunting. Alternatives include no development and seven alternative project locations. (Widman-Florida)
W72-14763

LONG HOLLOW CREEK CHANNEL CLEARING, NEZ PERCE, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.

Available from the National Technical Information Service as PB-205 676-D, $3.00 in paper copy, $0.95 in microfiche. January 12, 1972. 17 p, 2 map, 1 tab.

Descriptors: *Idaho, *Channel improvement, *Environmental effects, *Flood protection, Flood control, Dredging, Aesthetics, Rivers, River training, Watercourses (Legal aspects), Bank erosion, Channel flow, Flood proofing, Floodways, Flood profiles.
Identifiers: *Environmental Impact Statements, *Nez Perce (Idaho).

The proposed project involves clearing and reshaping the channel throughout a 5,000 foot reach of Long Hollow Creek through the village of Nez Perce, Idaho. The project is designed to help contain the flooding caused by the normal spring runoff and provide flood protection to the village. The channel will be altered so as to provide capacity for a maximum flow of 700 cubic feet per second. Grass will be planted to prevent bank erosion. The environmental impact of the project includes: clean-out dredging in 5,000 feet of the channel, spoil banks will be created on the left bank, reduced flood probability, aesthetic impairment of the natural stream, and some increased seasonal erosion downstream. The only adverse environmental impact is the temporary disruption of community life during construction. Alternatives include: allowing the village to assume the entire cost burden, flood plain management, a combination flood plain management-channelization program, rocklined low flow channel, and a upstream flood control structure. (Grant-Florida)
W72-14766

BALDWIN AND HANNON SLOUGHS, MONTGOMERY, ALABAMA, FLOOD PROTECTION (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as PB-200 023-F, $3.00 in paper copy, $0.95 in microfiche. June 2, 1971. 22 p, 1 map.

Descriptors: *Alabama, *Flood protection, *Environmental effects, *Channel improvement, Flood control, Flood damage, Rivers, Reservoirs, Bridges, Flood flow, Flood recurrence interval, Environment, Water control, Water quality, Streamflow, Benefits, Costs, Feasibility, Flood frequency, Wildlife habitats, Water quality control.
Identifiers: *Environmental Impact Statements, *Baldwin and Hannon Sloughs (Ala).

The proposed project will provide flood protection to a 1,022 acre area in and adjacent to Montgomery, Alabama. The project will involve clearing and snagging portions of the Baldwin and Hannon Slough channels and the replacement or modification of existing bridges and other structures which impede flood flows. Stream flow in the sloughs is intermittent with no flow occurring an average of three months each year. The general physical structure of the stream and its boundaries will be altered only slightly and the subsequent environmental changes will be minor. The significant effect will be the stabilization of the area through the elimination of flooding. There will be some loss of wildlife habitat and, during construction, a temporary adverse effect to water quality will occur. The alternatives studied and found unsuitable included levees, stream diversion, and reservoir protection. Foregoing action would result in continued yearly floods. There will be no conflict between local short-term uses of the environment and the maintenance and enhancement of the long-term productivity of the environment. Commitment of resources will include some wildlife habitat as well as labor and materials required for construction. (Ellis-Florida)
W72-14768

PANAMA CITY HARBOR, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Office of the Chief of Engineers (Army), Washington, D.C.

Available from the National Technical Information Service as PB-200 196-F, $3.00 in paper copy, $0.95 in microfiche. October 8, 1971. 51 p, 1 map, 3 tab.

Descriptors: *Florida, *Environmental effects, *Channel improvement, *Harbors, Dredging, Navigation, Turbidity, Spoil banks, Excavation, Channeling, Channels, Water resources development, Coastal engineering, Water quality, Water management (Applied), Transportation, Boats, Water pollution sources, Inland waterways, Gulf of Mexico.
Identifiers: *Environmental Impact Statements, *Panama City Harbor (Fla), St. Andrew Bay.

The proposed project provides for increasing depths in the existing federal project channel from the Gulf of Mexico into St. Andrew Bay for 1.1 miles and for new channels of 3.9 miles into Bay Harbor and 4.1 miles into Dyers Point near Panama City, Florida. The project is designed to meet present and future navigation needs in Panama City, Harbor. Deepening of the channel will improve the tidal flushing of St. Andrew Bay, which is heavily loaded with wastewater nutrients. However, this advantage may be offset by increased pollution from additional boat traffic. Adverse impacts include a temporary increase in turbidity of the waters during construction. Some loss to marine ecosystems, wildlife, and water quality values can be expected from spoiling of dredged material. This loss will be minimal because of the depth of the channel and relatively sterile bottom materials. Alternatives considered include different depths of the channels in the same alignment and no action. Brief comments of other agencies; environmental setting of the area without the project; relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and any irreversible commitment of resources are included. (Brackins-Florida)
W72-14769

KINGSTREE BRANCH FLOOD CONTROL PROJECT, BLACK RIVER BASIN, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.

Available from the National Technical Information Service as PB-206 101-F, $3.00 in paper copy, $0.95 in microfiche. March 20, 1972. 35 p, 1 map.

Descriptors: *Environmental effects, *South Carolina, *Flood protection, *Channel improvement, Flood control, Water control, Mosquitoes, Drainage, Floods, Turbidity, Silts, Sediment control, Channels, Rivers, Fish, Fish eggs, Environment, Benefits, Costs, Feasibility, Dredging, Canals, Spoil banks, Erosion control.
Identifiers: *Environmental Impact Statements, *Black River Basin (SC), *Kingstree (SC).

The proposed project is designed to reduce flooding and drainage problems in Kingstree, South Carolina, and will consist of channel enlargement and appurtenant work, beginning at the confluence of Kingstree Branch and the Black River and extending upstream 1.83 miles to the northern city limits. Physical damages or losses to property and improvements as well as other flood damage will be eliminated. The project will result in improved health conditions by providing drainage of mosquito breeding areas. Adjacent landowners will be required to furnish a portion of their property for right-of-way purposes. During construction minor inconveniences, such as noise, dust, and the effects caused by replacement of bridges and relocation of power and sewer lines will be experienced. Increased levels of siltation and turbidity downstream during construction will be controlled by a sediment trap in the canal so as to minimize damage to the eggs and young of fish species. Dredged material will be shaped and seeded to prevent erosion. Alternatives studied and found less feasible than the proposed project included flood plain management, levees, reservoirs, and channel improvement. Foregoing action would result in continued flood damage to the area. (Ellis-Florida)
W72-14770

UPPER COLORADO RIVER BASIN.
For primary bibliographic entry see Field 06E.
W72-14786

THE LOCATION OF THE LOWER MARGIN OF GROWTH OF TREES, SHRUBS, AND HERBACEOUS VEGETATION OF RIVER FLOODPLAINS AS A FUNCTION OF HYDROLOGICAL CONDITIONS,
P. P. Arsenov.
Nauchn Tr Primorsk S-Kh Inst. Vol 5, No 1, p 81-86. 1968.
Identifiers: *Plant growth, Bur marigold D, *Flood plains, Hydrologic properties, Formulas, Location, Shrubs, Trees, Vegetation, Willow D.

On the basis of a study of the Don River floodplain forests, a table was compiled of the location of the lower margins of growth of 12 trees, 13 shrubs, and 35 of the most widespread herbs. For most plants the difference between the relative elevations of the lower margins of their distribution terracewards and streamwards is very large. For white willow this difference is 3.3 m, for French willow 4.3 m, and for bur marigold 4.7 m. The lower margin of growth of the species toward the stream is determined by its ability to tolerate the maximum duration of flooding, while toward the terrace it is determined by the ability to withstand for some time excessive moisture or even flooding by groundwater. The relation of elevations in the floodplain area to the long-term mean duration of flooding was established. For any point in the floodplain area studied, the mean duration of flooding can be found with adequate accuracy by the following formulas: (a) For points higher than 1 m above mean low water, $x = (566/(y = 2.6) - 49$, and (b) For points 1 m or less above mean low water, $x = (88/y) + 29$, in which x is the length in days of the average duration of flooding, and y is the relative elevation in m of the point above the mean low water mark.--Copyright 1972, Biological Abstracts, Inc.
W72-14829

THE PROBLEM OF ISOLATION IN THE LOWLAND TROPICAL RAIN-FOREST,
Smithsonian Institution, Washington, D.C.
F. R. Fosberg.
Trop Ecol. Vol 11, No 2, p 162-168. 1970.
Identifiers: *Rain forests, *Vegetation, Tropical regions, Environment, Floristics, Isolation, Lowlands.

The floristic wealth of the lowland tropical rainforest is far greater than might be expected, considering the apparent uniformity of the rain-forest environment. This may be accounted for by the abundance of most essential resources, by the enormous length of the history of this formation, giving time for countless species to evolve, by the very real, though not very conspicuous, habitat diversity and resulting spatial and ecological isolation, and perhaps by a combination of enormously broad geographic ranges coupled with extremely sparse occurrence and limited dispersal capacity, also resulting in spatial isolation. Other possible mechanisms for isolation are developed of populations with different flowering seasons, and isolation by slow change over great lengths of time. The richness of the resource-pool in the tropical rainforest thus is matched by a comparably rich species-pool developed over the enormous history of this vegetation formation. Only in a resource-rich habitat that does not suffer extreme climatic vicissitudes could such a floristic wealth accumulate and persist.--Copyright 1972, Biological Abstracts, Inc.
W72-14853

SEMI-ARID WOODLANDS,
R. M. Moore, R. W. Condon, and J. H. Leigh.
In: Australian Grasslands, R. M. Moore, ed., ANV Press, Canberra, 1970, p 228-245. 2 fig, 8 photo.

Descriptors: *Arid lands, *Grasslands, *Grasses, *Biomes, *Semiarid climates, *Terrestrial habitats, Vegetation, Australia, Grazing, Soil types, Range management, Shrubs, Pastures.

A commentary is presented on the climate, soils, agricultural industries, grazing lands, pastures, and animal production of Australia. Considerable detail is devoted to the vegetational patterns over much of Australia with major emphasis on shrub woodland communities. However, much information is also included on arid and tropical grasslands and dominant understory plants in the shrub woodlands. (Black-Arizona)
W72-14866

AN IMPROVED TEMPERATURE PREDICTION MODEL FOR SMALL STREAMS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 02E.
W72-14920

DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-14930

FLOOD PEAKS AS MODIFIED BY DAM SIZE AND LOCATION,
State Univ. of New York, Syracuse. Coll. of Forestry.
For primary bibliographic entry see Field 02E.
W72-14954

ROLE OF BASEFLOW IN RAINFALL-RUNOFF RELATIONS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02A.
W72-14955

4B. Groundwater Management

SALTWATER INTRUSION EXTRACTION BARRIER,
California State Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 02F.
W72-14204

GROUND-WATER OUTFLOW, SAN TIMOTEO--SMILEY HEIGHTS AREA, UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA, 1927 THROUGH 1968,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-14233

GEOTHERMAL STEAM IN THE GEYSERS--CLEAR LAKE REGION, CALIFORNIA,
For primary bibliographic entry see Field 02F.
W72-14351

HYDROLOGY OF WESTERN COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
J. McCoy.
Geological Survey Open-file Report (72018), 1972. 61 p, 11 fig, 3 tab, 9 ref.

Descriptors: *Hydrology, *Water resources, *Rainfall-runoff relationships, *Groundwater resources, *Florida, Water supply, Water demand, Aquifer characteristics, Water yield, Groundwater recharge, Water quality, Chemical analysis, Hydrologic data, Water table, Water levels, Water pollution sources, Saline water intrusion, Injection wells, Urbanization, Water quality control, Canals, Water conveyance.
Identifiers: *Collier County (Fla).

Western Collier County, Florida, has large freshwater supply potential because of its 54 inches of rainfall annually and its manmade surface flow system, hydraulically connected to a shallow permeable aquifer. However, water problems exist because the rainfall is not evenly distributed throughout the year, causing a threat of salt-water intrusion in the Naples well field during prolonged dry seasons. Contamination of existing and future groundwater supplies by man-related activities including urbanization is of concern. The controlled surface-water flow system and the distribution of weirs allow for water control without an excessive lowering of groundwater levels. The system also has the potential for recharging the coastal section of the shallow aquifer during the dry seasons. Variable water quality and inadequate flows during the dry season precludes the use of the surface-water flow system as a direct source of municipal water. (Woodard-USGS)
W72-14359

POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W72-14434

FLUCTUATIONS IN NITRATE CONCENTRATIONS UTILIZED AS AN ASSESSMENT OF AGRICULTURAL CONTAMINATION TO AN AQUIFER OF A SEMIARID CLIMATIC REGION,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W72-14435

UNDERGROUND WASTE MANAGEMENT AND ENVIRONMENTAL IMPLICATIONS - A SYMPOSIUM.
American Association of Petroleum Geologists, Inc., Midland, Tex.
For primary bibliographic entry see Field 05G.
W72-14480

EVALUATION OF LIMESTONE FORMATION CHARACTERISTICS FROM WELL LOGS,
Qater Petroleum Co. Ltd., Umm Said.
D. J. Cregeen, and H. Moir.
Journal of Petroleum Technology, Vol. 12, No. 11, p 1087-1092, November, 1961. 4 fig, 3 tab, 4 ref.

Descriptors: *Logging (Recording), *Limestones, Evaluation, *Aquifer characteristics, Saturation, Cores, Permeability.
Identifiers: Critical saturation, *Water-bearing limestones, *Well logs, Hydrocarbon saturation, Gamma ray logs, Neutron logs.

The evaluation of limestone formations by well logs has brought many interesting problems to light, some of which are as yet unresolved. While a major purpose of well logging is to ensure that zones containing producible hydrocarbons are not bypassed, this paper is more concerned with the further information that can be derived from the logs to assist in more clearly defining reservoir characteristics, fluid content, and performance. Five selected topics are discussed in light of their application to the hard limestone reservoirs under review. The topics are: (1) Water Saturation, Sw; (2) Critical Saturation for Water Production; (3) Residual Hydrocarbon Saturation; (4) Distinguishing Between Oil and Gas; and (5) Detection of Shale. By careful selection of the quantities to be measured and by correlation of the results from well-log analysis with those obtained by independent means, it is possible eventually to supplant such expensive operational procedures as coring, its attendant analysis and stage production testing (to some degree). (Campbell-NWWA)
W72-14491

WELL CONSTRUCTION AND WATER QUALITY,
Department of Agriculture, Beltsville, Md.
For primary bibliographic entry see Field 05B.
W72-14494

HORIZONTAL WELLS AND DRAINS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 08B.
W72-14500

ENVIRONMENTAL FRAMEWORK OF GROUND-WATER CONTAMINATION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14502

BACTERIOLOGICAL AND CHEMICAL FACTORS IN INDUCED INFILTRATION,
For primary bibliographic entry see Field 05G.
W72-14504

HYDROGEOLOGIC FACTORS IN PROBLEMS OF CONTAMINATION IN ARID LANDS,
Nevada Univ., Las Vegas. Desert Research Inst.
For primary bibliographic entry see Field 05B.
W72-14508

MAXIMUM YIELDS FROM MINIMUM AQUIFERS,
Johnson (Edward E.), Inc., St. Paul, Minn.
For primary bibliographic entry see Field 08B.
W72-14509

BASIC PRINCIPLES OF WATER WELL DESIGN.
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W72-14512

GRAPHICAL METHOD FOR DETERMINING COEFFICIENT OF TRANSMISSIBILITY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 08G.
W72-14516

RELATIONS OF FRESH AND SALTY GROUND WATER ALONG THE SOUTHEASTERN U.S. ATLANTIC COAST,
Geological Survey, Brunswick, Ga.
For primary bibliographic entry see Field 02L.
W72-14518

HYDROLOGIC RECONNAISSANCE OF THE PROMONTORY MOUNTAINS AREA, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
J. W. Hood.
Utah Dept of Natural Resources, Technical Publication No 38, 1972. 42 p, 1 plate, 4 fig, 8 tab, 22 ref.

Descriptors: *Water resources, *Groundwater resources, *Hydrogeology, *Hydrologic data, *Utah, Precipitation (Atmospheric), Aquifers, Water wells, Water yield, Groundwater recharge, Water quality, Specific conductivity, Dissolved solids, Salinity, Water temperature, Water utilization, Surface waters, Runoff, Well data, Basic data collections.
Identifiers: *Promontory Mts (Utah).

The Promontory Mountains area of Utah is in eastern Box Elder County, and its drainage is directly tributary to Great Salt Lake. The drainage area consists of 228,000 acres. Groundwater is most uniformly available from unconsolidated and semiconsolidated rocks of Cenozoic (Tertiary and Quaternary) age. Part of the water is derived from precipitation, which is estimated to average 240,000 acre-feet annually. Of this amount, about 93 percent is consumed at or near the point of fall. An estimated 4,000 acre-feet runs off in streams. The total runoff is estimated to average 6,000 acre-feet and includes unconsumed spring discharge. Average annual groundwater recharge and discharge are in balance and amount to 27,000 acre-feet each. Recharge derived from precipitation is estimated to average 12,000 acre-feet annually. Storage may have been depleted slightly only in the two small areas that contain a few irrigation wells. Estimates for groundwater discharge include evapotranspiration (14,000 acre-feet), subsurface outflow (9,000 acre-ft), wells (2,000 acre-ft), and unconsumed spring discharge (2,000 acre-ft). The dissolved-solids concentration in water samples analyzed ranged from 272 to 24,900 mg per liter. (Woodard-USGS)
W72-14526

A PRELIMINARY INVESTIGATION OF TERRESTRIAL AND LOW ALTITUDE AERIAL INFRARED PHOTOGRAPHY AS AN AID IN DETERMINING WATER TABLE DEPTHS AND BURIED GEOLOGICAL STRUCTURES IN THE PIERRE SHALE IN WESTERN SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City.
For primary bibliographic entry see Field 07B.
W72-14527

WATER RESOURCES OF NORTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14540

PROPOSED CLOSED BASIN DIVISION, SAN LUIS VALLEY PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.

Available from the National Technical Information Service as PB-202 805D. $3.00 in paper copy, $0.95 in microfiche. Revised May 1971. 9 p, 1 map.

Descriptors: *Colorado, *Groundwater, *Environmental effects, *Groundwater recharge, Aquifers, Impounded waters, Waterfowl, Wildlife conservation, Vegetation effects, Water level fluctuations, Water table, Surface-groundwater relationships, Wildlife habitats, Wetlands, Irrigation programs, Wells, Pumps, Pumping, Water management (Applied), Salt tolerance.
Identifiers: *Environmental Impact Statements, *San Luis Valley Project (Colo).

The project is designed to salvage an average of about 100,800 acre-feet of water annually in the Closed Basin Division of the San Luis Valley, Colorado, primarily by lowering the ground water level through pumping. Project features include a system of 136 wells and pumping stations, well field laterals and 55 miles of conveyance channels. A 13,800 acre wildlife refuge will also be established. The proposed plan would lower the water table in the area a minimum of about 8 to 10 feet. The level of the San Luis Lake would be stabilized, creating a much needed cold-water fishery and source of area recreation. The drainage of existing wetlands interspersed in the project area would involve loss or drastic reduction of over 100,000 acres of waterfowl habitat. There will also be a loss in the quality of dove nesting habitat. There are no unresolved conflicts concerning alternative uses of the water and land resources. To forego development in the Closed Basin would result in further degradation of the area from its natural state. The plan provides for stage development of the water salvage features and observation during operation to provide a check on ground water conditions. (Waldron-Florida)

W72-14573

PROCEDURE AND RESULTS OF GROUNDWATER POLLUTION STUDIES IN TEHERAN AREA, IRAN,
Ministry of Water and Power, Teheran (Iran). Research Div.
For primary bibliographic entry see Field 05B.
W72-14590

ON HYDROGEOLOGY AND GROUNDWATER WELLS OF ETHIOPIA,
Ministry of Public Water Works, Addis Ababa, (Ethiopia). Water Resources Dept.
A. O. Idris.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 8-9, 1972. 1 tab.

Descriptors: *Data collections, *Hydrologic data, *Water wells, Hydrogeology, Water quality.
Identifiers: *Ethiopia.

Information about groundwater wells in Ethiopia was collected from geological logs, water data, and drilling reports of the wells drilled by the Water Resources Department. The Water Resources Department drilled 355 wells. The purpose of the study is to collect the groundwater data of the Water Resource Department and to give a general picture of the groundwater condition in Ethiopia. (Knapp-USGS)
W72-14591

PALEOZOIC SANDSTONE AQUIFERS IN SAUDI ARABIA,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
For primary bibliographic entry see Field 02F.
W72-14593

GROUNDWATER RECHARGE BY DAMMED UP RIVERS,
H. W. Holz.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 72-79, 1972. 8 fig.

Descriptors: *Artificial recharge, *Bank storage, *Reservoirs, *Meanders, *Induced infiltration, Hydrogeology, Alluvial channels, Water management (Applied), Water levels, Water table.
Identifiers: Weser River (Germany).

Along the River Weser, Germany, several gate weirs were built to make the river navigable the whole year. By installing the barrages, the natural effluent groundwater river system was reversed into an influent one. A dense grid of observation wells was installed in order to monitor the predicted impairment of domestic and stock wells, as well as the wetting of agriculturally used land. About three observation wells per square kilometer were drilled. Measurement of the water level started one year before impounding the river. From then on, the depth of water table was measured regularly every other week for ten years. By damming a river, water from the river is bank stored and the groundwater table rises. Pumping this additonal available water is feasible especially if the river is meandering. Two locations are particularly suited for supply wells. The first one is the intersection between the axis of a meander above the dam and the interface between infiltrated river water and natural groundwater. The other promising place is within the meander below the dam. There, only infiltrated river water will be pumped even if there is no canal cutting off the meander. (Knapp-USGS)
W72-14595

ARTIFICIAL RECHARGE IN JAPAN,
Geological Survey of Japan, Kawasaki.
T. Konishi.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 80-87, 1972. 5 fig, 5 tab.

Descriptors: *Artificial recharge, *Water management (Applied), Water conservation, Reviews, Research and development, Injection wells.
Identifiers: *Japan.

Artificial recharge is a relatively recent development in Japan. The first official attempt of artificial recharge in Japan was made in 1951. At that time Amagasaki City drilled a well 500 mm in diameter and 70 m deep at the bed of Mukogawa River, and the river water was recharged underground. After this attempt, artificial recharge of water came to be recognized as a necessity, and there are many cases where industrial plants recharged water artificially in order to secure groundwater for their own use. Also injection of water is used for lowering sewerage costs and for prevention of land subsidence. (Knapp-USGS)
W72-14596

ESTIMATING THE TRANSMISSIVITY OF AQUIFERS FROM THE FORMATION CONDUCTANCE,
Ministry of Water and Power, Tehran (Iran). Div. of Groundwater.
A. M. Aiamouti.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 117-120, 1972. 4 fig, 2 tab, 9 ref.

Descriptors: *Aquifer testing, *Specific conductivity, *Transmissivity, *Drawdown, *Specific capacity, Water yield, Aquifer characteristics, Groundwater movement, Water levels.
Identifiers: *Iran, *Well efficiency.

The specific capacity of a well can be used for estimating the coefficient of transmissivity, assuming that the well is 100 percent efficient. In reality, however, this assumption is not valid as the head loss incurred by friction entering the well and traversing the pump assembly is never zero. The resulting specific capacity, as determined by water-level measurements in the well, is always less than its true value. In order to get the true value of specific capacity and make a better estimation of transmissivity, the result of step-drawdown tests can be used. By dividing the discharge of the well by the formation loss, an acceptable correlation can be obtained between formation conductance and transmissivity. This method has been successfully utilized in Iran as a rough means for controlling the result of interpretations of many pumping tests and in choosing between different values of transmissivity obtained from the application of drawdown and recovery tests. (Knapp-USGS)
W72-14597

GRAPHICAL METHOD FOR ESTIMATING THE TRANSMISSIBILITY AND STORATIVITY OF AQUIFERS FROM SPECIFIC CAPACITY OF WELLS,
Egyptian Desert Inst., Cairo.
For primary bibliographic entry see Field 02F.
W72-14603

A STUDY ON THE MECHANISM OF CONFINED GROUNDWATER RECHARGE,
Tokyo Univ. (Japan). Faculty of Engineering.
For primary bibliographic entry see Field 02F.
W72-14605

AN EVALUATION OF IRRIGATION POTENTIAL IN THE BONANZA VALLEY,
Minnesota Univ., Benson. Agricultural Extension Service.
For primary bibliographic entry see Field 03F.
W72-14611

GROUND-WATER RESOURCES OF ORANGE AND ULSTER COUNTIES, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-14726

GROUND WATER IN CENTRAL ST. CROIX, U.S. VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
T. R. Robinson.
Geological Survey Open-file Report, 1972. 18 p, 16 fig, 1 tab, 13 ref.

Descriptors: *Groundwater resources, *Water yield, *Water quality, *Water supply, *Virgin Islands, Reviews, Evaluation, Water demand, Water pollution sources, Salinity, Water wells, Pumping, Aquifer characteristics, Groundwater recharge, Saline water intrusion, Water treatment, Electrodialysis.
Identifiers: *St. Croix (V.I.).

The principal aquifer in central St. Croix, U.S. Virgin Islands, consists of the Kingshill Marl and associated alluvium. In one area, well yields of a few hundred gallons per minute are possible. In other places well yields are 5 to 40 gpm (gallons per minute) from the alluvium and 10 to 40 gpm from the marl. Groundwater recharge is approximately 3 percent of rainfall or about 1 3/4 mgd (million gallons per day). Pumpage is estimated to be less than 1 mgd. The water available at typical well depth is brackish and high in sodium chloride and sodium bicarbonate. The total water stored in the aquifer is estimated to be 130 billion gallons. About 35 billion gallons of this water could be recovered and desalted by electrodialysis. At projected levels of water use, this water of better quality would be exhausted in about 29 years. Replenishing the aquifer with treated sewage would extend the time to about 38 years. More water of poorer quality could be desalted by more expensive methods, such as distillation. (Woodard-USGS)
W72-14731

GROUND-WATER CONDITIONS IN THE EAST SHORE AREA, BOX ELDER, DAVIS, AND WEBER COUNTIES, UTAH-1960-69,
Geological Survey, Salt Lake City, Utah.
E. L. Bolke, and K. M. Waddell.
Utah Dept of Natural Resources, Salt Lake City, Technical Publication No 35, 1972. 59 p, 3 plate, 5 fig, 2 tab, 20 ref.

Descriptors: *Groundwater resources, *Hydrologic data, *Basic data collections, *Well data, Utah, Aquifers, Water yield, Groundwater recharge, Water quality, Water utilization, Water level fluctuations, Water supply, Water demand, Semiarid climates, Water importing, Surface waters.

Groundwater conditions (1960-69) are described for the East Shore area in north-central Utah between the east shore of Great Salt Lake and the Wasatch Range. Annual ground-water withdrawals for municipal and industrial supply increased from about 10,000 acre-feet in 1960 to about 21,000 acre-feet in 1969. Additional pumpage for irrigation and other purposes was about 5,500 acre-feet in 1969. Most of the water that is used for agriculture is supplied by surface-water sources. During 1960-69 water levels rose an average of 5 feet in the Bountiful and Brigham districts. There was an average decline of 10 feet in the Weber Delta district, chiefly as a result of withdrawals from wells. The rise of water levels in parts of the Bountiful district was due to

decreased withdrawal from wells brought about by importing water from the Weber River basin, and to additional recharge from use of imported water for lawn irrigation. The water quality has varied locally, but it has generally been a year-to-year fluctuation rather than a long-term trend. Most of the water is suitable for both domestic use and irrigation. (Woodard-USGS)
W72-14742

DECISION ANALYSIS IN WATER RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06B.
W72-14845

IF THE PUMPS RUN DRY...,
Washington State Water Research Center, Pullman.
D. C. Flaherty.
In: Washington State's Water, A State of Washington Water Research Center Report-1971, p 2-10, 3 fig, 1 map.

Descriptors: *Groundwater mining, *Hydrologic budget, *Water supply, *Wells, *Irrigation effects, *Irrigation systems, *Sprinkler irrigation, *Water levels, *Water table aquifers, *Irrigation engineering, Cost analysis, Recharge, Water table, Aquifers, Social aspects, Political aspects, Economics, Cost-benefit ratio, Washington, Hydrogeology, Crop production.

A synopsis of results from a Washington State University study team, assembled to investigate decreasing water tables in the central Washington region, is presented. Experiments by enterprising agriculturalists have revealed that deep wells, expensive pumps and massive sprinkler systems can produce twice the wheat of conventional dry farming methods. However, studies show that levels of aquifers have dropped more than 12 ft/yr under some farms. Much of the countryside around Lind and Odessa had to be closed to further drilling in 1968 until a management plan could be developed. Team economists warn that income returns are directly dependent on water table stability. Some of the difficult issues in ground-water management including user competition, legal problems, various crop alternatives, channelization, and socio-economic constraints are discussed. (See also W72-14618) (Black-Arizona)
W72-14865

ON THE DELIMITATION OF GROUNDWATER RECHARGE AREAS AROUND BERJESIYAH,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
S. B. Al-Jawad, W. I. Haddad, H. A. Hassan, and A. A. van der Sluijs.
Iraq Ministry of Higher Education, Council for Scientific Research Technical Report No 12, 1970. 33 p, 4 tab, 3 fig, 4 maps, 3 ref.

Descriptors: *Groundwater recharge, *Aquifers, *Hydrogeology, *Aquifer characteristics, *Areal hydrogeology, *Groundwater, *Sand aquifers, Geology, Geomorphology, Water table, Arid lands, Depression storage, Water storage, Water table aquifers, Zone of saturation, Water chemistry, Groundwater movement, Subsurface mapping, Infiltration, Water quality, Salinity.
Identifiers: I*raq.

A survey of groundwater flow was conducted for the Zubair and Berjesiyah areas of Iraq in September and October 1967, and February and March 1968, to study the possibility of local groundwater recharge of the Dibdibba sandstone aquifer. A map with water table contours was obtained by plotting the data collected on a 1:50,000 map of the Berjesiyah area. Conception of a lateral flow of groundwater towards the Berjesiyah depression, where it mixes with locally infiltrating rain water, seems to be confirmed by the tendency of the water quality to improve towards the depression. Prospection for groundwater with geoelectrical methods was conducted to determine the depth and extent of fresh water. Near Zubair, the Dibdibba sandstone contains a freshwater layer which floats on a salt water mass of great thickness. Farmers' wells tend to become brackish. The deeper aquifer shows a very high salt content, varying from that similar to sea water up to saturation point. Exploitation of the upper aquifer would constitute a serious risk. General aspects such as geology, geomorphology, water table data, and hydrochemical data of the Berjesiyah and Zubair areas are also included. (Black-Arizona)
W72-14870

HYDROLOGICAL AND SOIL PHYSICAL CONDITIONS IN A PILOT AREA IN THE GREATER MUSSAYEB PROJECT,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 02G.
W72-14871

PRELIMINARY STUDIES ON GROUNDWATER IN SAMARATIKRIT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
R. H. Haddad, S. B. Jawad, and W. I. Haddad.
Iraq Ministry of Higher Education, Council for Scientific Research, Technical Report No 13, 1970. 30 p, 2 fig, 2 tab, 3 ref.

Descriptors: *Arid lands, *Hydrogeology, *Base flow, *Salinity, *Groundwater recharge, *Aeral hydrogeology, *Groundwater resources, Aquifers, Artificial recharge, Groundwater, Geological mapping, Potential water supply, Irrigation effects.
Identifiers: *Iraq.

Purpose of the study, which began in 1969, is to make a hydrological survey of the Samara-Tikrit area in Iraq, located along the eastern bank of the Tigris river nearly 100 miles north of Baghdad, and to learn about its hydrological problems with regard to groundwater in order to make better use of this resource both domestically and agriculturally. Preliminary results indicate that most hydrological problems in the area stem mainly from high salinity and poor management. Groundwater in the study area was found to be generally unsuitable for human consumption and is used primarily for animal drinking and irrigation. Recommendations include investigations of artificial recharge possibilities, calculations of aquifer permeability, best methods of recharge, and water table fluctuations during and after recharge of main aquifer. Information is presented on geology, geomorphology, groundwater depth, and groundwater quality (chemical analysis) of the study area. (Black-Arizona)
W72-14872

ASPECTS OF AQUIFER MANAGEMENT,
Environmental Protection Agency, Ada, Okla. National Groundwater Research Program; and Environmental Protection Agency, Washington, D. C. Water Quality Office.
L. G. McMillion, and D. Olsson.
The Cross Section, Vol 18, No 3, March 1972. p 1-2, 4. 1 tab, 22 ref.

Descriptors: *Legal aspects, *Groundwater resources, *Water management (Applied), *Common law, *Prior appropriation, Humid areas, Arid lands, Reasonable use, Water rights, Regulations.

Legal aspects of aquifer management are outlined in response to current governmental involvement in the development and redistribution of water over large areas. Legal doctrines are divided into two major categories--Common Law Doctrine and Prior-Appropriation Doctrine. Common Law Doctrine, derived from England, is applied generally to humid and eastern states. Its expressed interest is protection of land-based property rights. Correlative rights, or California law, is a variation of the reasonable use concept. Prior-Appropriation Doctrine grants water rights to first users without regard to land ownership. It was developed in the western states, where aridity dictated that waster was of major importance and value. Applications of these doctrines are presented along with statewide regulatory programs. (Popkin-Arizona)
W72-14876

'SLATON CHANNEL' -- A BURIED VALLEY,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
D. D. Smith.
The Cross Section, Vol 18, No 3, March 1972. p 3. 2 fig.

Descriptors: *Geological surveys, *Geologic history, *Aquifer characteristics, *Erosion, *Topography, Great Plains, Aquifer systems, Texas, Groundwater.

Results are reported of the geologic investigation which located the areal and vertical extent of the Slaton Channel, an ancient river valley filled with rocks of the Ogallala formation in the Texas High Plains. Well logs form the basis of the report. Geologic history of the area includes the 60 million-year old Laramide revolution, followed by oceans of Cretaceous time withdrawing and subjecting the land surface to 50 million years of erosion. The Slaton Valley was one of the major drainage patterns developed. Renewed uplift in the Southern Rocky Mountains, and increased rainfall, caused decreasing stream gradients, and deposition of sands and gravels in the stream channels. The Ogallala top surface gives no sign of the buried topography. Instead of the usual 100-foot thickness, the Ogallala aquifer may extend to 300 over the Slaton Valley. (Popkin-Arizona)
W72-14877

WATER BROUGHT TO HIGHWAY REST AREA THE 'HARD' WAY.
Public Works, Vol. 103, No. 7, p 78-79, July 1972. 4 photo.

Descriptors: *Water supply, *Wells, *Economic feasibility, Salts, *Reverse osmosis, Water quality, Leaching, *Treatment facilities, Desalination.
Identifiers: *Sunset Point Rest Area (Ariz), Electro-dialysis.

Arizona's Sunset Point Rest Area on Interstate No. 17 between Phoenix and Flagstaff is discussed. The chief problem of this rest stop was a water supply for the traveller. A detailed study indicated that drilling a well would be the most feasible economic operation. A well was dug to 1.059 feet with a 500-foot artesian head. Samples of the water contained 1,837 mg/L of soluble salts against an allowable 500, and many other fluorides. A reverse osmosis system was used to purify the water. This water purification system operates on an electro-dialysis principle, which employs an electrical charge to pull salts through membrane filters, leaving potable water for consumption. In order to plant trees, holes were blasted. Since the soil had no leaching capability, a lagoon-type sewage facility was required. Water lines had to be below the frost line, in a rocky soil full of granite outcroppings. Power had to be brought in over a considerable distance, as did all construction materials. (Strachan-Chicago)
W72-14886

A CASE HISTORY IN GROUND WATER COLLECTION,
Public Utilities, Mankato, Minn.

W. V. Lacina.
Public Works, Vol. 103, No. 7, p 52-54, July 1972. 2 photo, 2 fig.

Descriptors: *Groundwater resources, *City planning, *Long-term planning, Water supply, Yield strength, Maintenance costs, Economic feasibility, Corrosion control, Clogging, Land use, Quality control, Pumping, *Minnesota.
Identifiers: *Mankato (Minn), *Metropolitan water resources management, Ranney horizontal collector well.

Planning for future requirements and experienece in ground water collection have permitted Mankato, Minnesota to keep relatively free of the municipal water problems that confront many large and small cities. The focus of Mankato's effort to upgrade its systems is the recent installation of a Ranney horizontal collector well which alone matches the output of six vertical wells which the City had previously used for water supply. The City has enough capability to handle its anticipated growth and demand for the next decade. The horizontal collector was selected on two criteria higher yield and negligible maintenance cost. Corrosion and clogging of screens, two factors which increase maintenance costs, are reduced in horizontal collector wells. Corrosion is reduced because the screens in a collector pipe are always submerged completely. Horizontal collector well systems establish a graduated natural filter around each screen pipe, permitting low-velocity entrance of the water into the pipe. Flushing of individual screen pipes is accomplished by closing off all but one of the control valves and temporarily lowering the water level in the caisson. The geophysical area of Mankato characterizes many of the favorable conditions for a horizontal collection system: (1) an aquifer or water-saturated strata holding large quantities of water, (2) unconsolidated materials in the aquifer which allow projection of horizontal collector pipes and provide a natural permeable filtration, and (3) a hydrological cycle that provides surface water infiltration. Some of the benefits include: good use of land, better quality control, and pumping economy. (Strachan-Chicago)
W72-14889

DEVELOPMENT AND MANAGEMENT OF GROUND WATER AND RELATED ENVIRONMENTAL FACTORS IN ARID ALLUVIAL AND CARBONATE BASINS IN SOUTHERN NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.
R. L. Bateman, A. L. Mindling, R. L. Naff, and H. M. Joung.
Available from the National Technical Information Service as PB-212 382, $3.00 in paper copy, $0.95 in microfiche. Center for Water Resources Research, Desert Research Institute Project Report No 18, January 1972. 43 p, 16 fig, 7 tab, 8 ref, 5 append. OWRR C -2212 (No 3411) (1).

Descriptors: *Groundwater basins, *Competing uses, *Management, *Computer models, *Nevada, Arid lands, Environmental effects, Priorities, Warm springs, Aquifers.
Identifiers: *Desert pupfish (Cyprinodonts), *Amargosa Desert (Nev), Regional groundwater flow systems.

Groundwater resources of arid and semi-arid basins in the southwestern United States are generally developed within bounds imposed by physical, legal, and economic constraints. In Ash Meadows, a portion of the Amargosa Desert of south-western Nevada, groundwater development is subject to the additional constraint of preserving the rare desert pupfish (Cyprinodonts) which inhabit spring pools within the area. Continued withdrawal of groundwater for agricultural purposes will eventually decrease water levels to the extent that the natural habitats of the pupfish may be damaged. An unsteady state digital groundwater model is developed to assist in evaluation of these groundwater production problems. The model is verified by comparison of simulated and observed water level responses to the actual pumping history. Preliminary evaluation of alternative pumping locations (well sites) is made as regards their probable effect on water levels in critical areas. In addition, the suitability of available water and soils for agricultural purposes is evaluated and possible improvements discussed.
W72-14916

WELLS AND STREAMS: RELATIONSHIP AT LAW,
Missouri Univ., Columbia. Coll. of Law.
P. N. Davis.
Missouri Law Review, Vol. 37, No. 2, p 189-245, 1972. 7 tab, 151 ref, append.

Descriptors: *Groundwater, *Water utilization, *Water rights, *Watercourses (Legal aspects), *Missouri, Legal aspects, Water law, Common law, Judicial decisions, Hydrologic aspects, Stream flow, *Wells, Hydrologic cycle, Surface waters, Groundwater mining, Reasonable use, Diversion, Riparian rights, Water allocation (Policy).

Existing allocation rules concerning the hydrologic relationship between percolating groundwater and surface watercourses are evaluated. Two issues are discussed in great detail: first, when does a hydrologic connection exist.; second, will surface watercourses, percolating groundwater, or other rules be applied in various types of situations. Decisions from the United States, England, and Ireland are examined to determine if any trends have been established in spite of the absence of a clear doctrine in point. Eastern states should update their groundwater allocation rules to correspond with present day knowledge and the expense of hydrologic testing. Since groundwater movement can now be determined by routine methods, the contention that it is unknown can no longer justify the absolute ownership and reasonable use rules of groundwater. Two rules are set forth, one applying to high capacity wells and the other to small wells. Depending on the well size, a certain degree of knowledge about local groundwater movement will be imputed. This knowledge will determine liability for unreasonable injurious consequences. These rules correlate well with existing rules applicable to underground streams and remedy the illogic accepted by many eastern courts that percolating groundwater, diffused surface water and surface watercourses constitute independent classes of water. (Beardsley-Florida)
W72-14934

BIBLIOGRAPHY OF GROUND-WATER STUDIES IN NEW MEXICO.
New Mexico State Engineer, Santa Fe.
For primary bibliographic entry see Field 02F.
W72-14938

4C. Effects on Water of Man's Non-Water Activities

THE EFFECTS OF RAINFALL INTENSITY, PAVEMENT CROSS SLOPE, SURFACE TEXTURE, AND DRAINAGE LENGTH ON PAVEMENT WATER DEPTHS,
Texas Transportation Inst., College Station.
B. M. Gallaway, R. E. Schiller, Jr., and J. G. Rose.
Available from NTIS, Springfield, Va 22151, PB-206 497, Price $3.00 paper copy; $0.95 microfiche. Research Report 138-5, May 1971. 69 p, 19 fig, 13 tab, 32 ref.

Descriptors: *Rainfall, *Paving, *Highways, *Road construction, *Texas, Engineering structures, Water control, Materials testing, Testing procedures, Road design, Slopes, Drainage systems.

Determinations were made concerning the amount of water which can be expected to exist on various pavement types under normal ranges of pavement cross slopes, rainfall intensities, pavement textures, and drainage lengths. Equations were developed which relate these variables and their relative effects to water depth. Results are presented in both tabular and graphic form. Nine different types of surface were tested. The surfaces were placed on individual 28-foot long by 4-foot wide, double tee, prestressed concrete beams. Rainfall of uniform intensity was applied to the surface. Water depth measurements were taken at regularly spaced drainage lengths for various combinations of rainfall intensity and pavement cross slope. Multiple regression analyses were used to determine the best fit of the data. For a rainfall intensity of 1/5 in/hr, a surface texture of 0.03 in., and a drainage length of 24 ft., increasing the cross slope from 1/16 in/ft to 1/4 in/ft decreased water depths by 62 percent in the outside wheel path (Approximately 21 feet from the top of the drainage area). Correspondingly, increases in surface texture decreased water depths; whereas, increases in rainfall intensity and drainage length increased water depths. (Woodard-USGS)
W72-14360

JETPORT: PLANNING AND POLITICS IN THE BIG CYPRESS SWAMP,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 06G.
W72-14548

PERICO ISLAND PERMIT APPLICATION, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 06G.
W72-14564

THE INFLUENCE OF MAN ON THE HYDROLOGICAL CYCLE,
For primary bibliographic entry see Field 02A.
W72-14716

DESIGN ASPECTS AND PERFORMANCE CHARACTERISTICS OF RADIAL FLOW ENERGY DISSIPATORS,
Texas Univ., Austin. Center for Highway Research.
For primary bibliographic entry see Field 08B.
W72-14730

4D. Watershed Protection

SWEETWATER CREEK WATERSHED PROJECT, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-206 396-F. $3.00 in paper copy. November 1971. 28 p, 1 map, 1 tab.

Descriptors: *Tennessee, *Environmental effects, *Flood protection, *Channel improvement, Erosion control, Watersheds (Basins), Conservation, Land use, Flood control, Floods, Flood plains, Dams, Project benefits, Project purposes, Stream improvement, Multiple-purpose projects, Flooding, Aquatic environment, Agriculture, Area redevelopment, Water management (Applied), Flood damage, Dredging.
Identifiers: *Environmental impact statement, *Sweetwater Creek (Tenn), *Conservation land treatment measures.

The project consists of accelerated conservation land treatment measures and nine floodwater retarding structures supplemented with 42.3 miles of channel improvement for flood protection in the Sweetwater Creek Watershed, Tennessee. The land treatment measures will reduce runoff and erosion, increase the vegetative cover and improve the scenic quality of the landscape. The combined land treatment and structural measures will reduce urban property damage and crop and pasture damage due to floods in the flood plain. The reservoirs will create the potential for 132 acres of lake fishery and waterfowl resting area. The project will enhance the overall economic development of the area. Adverse effects include inundation of seven tenths mile of stream by the reservoirs, temporary disturbance of aquatic life during channel improvement installation, and periodic loss of some land to agriculture and wildlife use. Various alternative combinations of structural locations, structural measures, land treatment measures and non-structural measures such as flood plain zoning were considered as alternatives. Comments from interested agencies are included. (Brackins-Florida)
W72-14265

BIG CREEK AND TRIBUTARIES, LOWER WHITE RIVER BASIN, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W72-14267

HILLSDALE LAKE, BIG BULL CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08D.
W72-14275

METHOD OF CONTROLLING EROSION ON SEASHORES,
Z. Csiszar.
U. S. Patent No. 3,564,853, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 883, No 4, p 1390, February 23, 1971.

Descriptors: *Patents, *Beach erosion, Shore protection, Equipment, *Sand movement, *Erosion control, *Breakwaters, Coasts, Ocean waves, Littoral drift.

Two types of flexible curtains or screens are provided to control the movement of drifting sand. The first, a breakwater curtain consists of a continuous, perforated curtain made of strong and durable material, resistant to marine life. Its seaside end is weighted to the sea floor, the landside end is kept suspended at the required depth by a floater, anchored by a flexible cable in the sea floor. The second, a groyne-curtain consists of a flexible mesh with the bottom end weighted to the seafloor and the top end attached to a floater, holding the curtain suspended in a vertical position. This curtain oscillates with the waves. Positioning of this shore protection device depends upon an understanding of wind direction, longshore currents and sand movement. (Sinha-OEIS)
W72-14464

WINTERS CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-208 584-F, $3.00 in paper copy, $0.95 in microfiche. March 1972. 21 p, 2 map, 1 tab.

Descriptors: *Channel improvement, *Nebraska, *Soil conservation, *Environmental effects, Conservation, Protection, Project purposes, Erosion control, Sedimentation, Wildlife habitats, Flood protection, Riprap, Construction, Flooding, Flood frequency, Agricultural watersheds, Watersheds (Basins), Adoption of practices, Agricultural runoff, Agricultural engineering.
Identifiers: *Environmental Impact Statements, *Winters Creek Watershed (Neb).

The project involves conservation land treatment within the 89,710 acre Winters Creek Watershed, supplemented by construction of one floodwater retarding structure and 7.2 miles of channel enlargement. The project area is located along the North Platte River in Scotts Bluff and Sioux Counties of Nebraska. The area is predominantly farmland. The project will protect parts of the area from a 100-year storm and other parts from a 200-year storm. Favorable environmental effects include the following: reduced stream sedimentation, reduced sediment and floodwater damage in agricultural areas and urban areas, enhanced stream fisheries, expanded quality and quantity of wildlife habitats, and reduced mosquito production in urban areas. Adverse environmental impacts include temporarily increased sedimentation during construction, unsightly sediment and debris deposits in dry pool areas, and periodic inundation of 400 acres of grassland with resulting loss of wildlife habitat. The following possible project alternatives were considered: alternative floodwater retarding structure locations, further enlargement of Winters Creek Drain, diversion of Scottsbluff Drain, flood proofing of buildings, rezoning, and additional purchase of private lands. (Grant-Florida)
W72-14559

LEVEE AND DRAINAGE MODIFICATIONS SCAPPOOSE DRAINAGE DISTRICT; COLUMBIA RIVER, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-198 847-F, $3.00 in paper copy, $0.95 in microfiche. February 29, 1972. 81 p, 1 map, 8 photo, 2 tab.

Descriptors: *Oregon, *Levees, *Environmental effects, *Drainage districts, Flood protection, Levee districts, Drainage effects, Drainage practices, Drainage systems, Subsurface drainage, Wildlife habitats, Water table, Water storage, Columbia River, Pumping plants, Project purposes, Project benefits.
Identifiers: *Environmental Impact Statements, *Columbia River (Ore).

The proposed project involves modification of the existing levee and drainage system of Scappoose Drainage District on the lower Columbia River in Oregon. The purpose of the modifications is to increase the protection to the district from severe seepage and levee failure during unusually high water. Project features include the replacement of two existing pumping stations with stronger ones, construction of a new drainage canal and sublevee, and other modifications to the existing levee. About 170,000 cubic yards of material will be excavated. Environmental impacts include the following: more productive agricultural land use from improved drainage, occasional pasture flooding, loss of 7 acres of farmland, and associated land changes due to more intensive land use. Adverse impacts include temporary loss of valuable wildlife ground cover, loss of trees during construction, loss of 11 acres of grassland, and lowering of the water table which may encourage more undesirable urban uses. Alternative seepage control measures and water removal devices were considered as was the alternative of no action. (Grant-Florida)
W72-14560

EDEN WATERSHED, MISSISSIPPI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Jackson, Miss.

Available from the National Technical Information Service as PB-202 301F. $3.00 in paper copy, $0.95 in microfiche. March 1972. 33 p, 1 map, 1 tab.

Descriptors: *Mississippi, *Soil conservation, *Flood protection, *Environmental effects, Flooding, Flood damage, Flood control, Wildlife habitats, Conservation, Project purposes, Project benefits, Erosion control, Adoption of practices, Stream stabilization, Channel improvement, Structures, Water quality control, Sedimentation, Turbidity, Agricultural watersheds.
Identifiers: *Environmental Impact Statements, *Eden Watershed (Miss).

The project involves conservation land treatment of 10,817 acres in the Eden Watershed area of Yazoo County, Mississippi. Also included in the project is the construction of one floodwater retarding structure, three grade stabilization and sediment control structures, 25 miles of stream channel enlargement and 4 miles of new channel. The area is largely flat delta with some woods and a bluff area. The project is designed to protect against flooding and to abate erosion of agricultural land. Favorable environmental impacts of the project include: 20 per cent erosion and sediment reduction, 70 per cent reduction in flood plain sediment damage, reduction of floodwater damage, and creation of 14 acres of water surface for fishing and wildlife. Adverse impacts include: loss of agricultural use and wildlife habitat on 16 acres, loss of agricultural production of 50 acres of cropland, temporary turbidity and silting during construction, elimination of channel vegetative cover, and water quality impairment in the channel. Alternatives considered include: conservation land treatment alone, less intensive land use by retiring wetlands, no action, and varying structural alternatives. (Grant-Florida)
W72-14562

DUST ABATEMENT AT CANYON FERRY LAKE, CANYON FERRY UNIT, HELENA--GREAT FALLS DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Billings, Mont. Region 6.

Available from the National Technical Information Service as PB-203 097F. $3.00 in paper copy, $0.95 in microfiche. February 14, 1972. 48 p, 3 map.

Descriptors: *Environmental effects, *Montana, *Missouri River, *Wind erosion, *River basin development, *Dust storms, Flood control, Irrigation, Recreation, Fish conservation, Wildlife conservation, Dikes, Wildlife habitats, Aquatic habitats, Waterfowl, Lake basins, Turbidity, Erosion control.
Identifiers: *Missouri River basin, *Canyon Ferry Lake, *Environmental impact statements, *Helena-Great Falls (Mont).

Canyon Ferry Lake, formed by Canyon Ferry Dam on the Missouri River in Broadwater and Lewis and Clark Counties, Montana is at low elevations during the late winter and spring. Strong winds pick up dry soil and cause severe dust storms when there is little snow cover or when rainfall and beaches are exposed. The plan for dust abatement involves construction of dikes to form subimpoundments to cover exposed areas, dredging of fine material from the lakeside into the subimpoundments, and flooding the subimpoundments for development of wildlife habitat. Implementation of the plan will convert a section of the lake, which is wasteland and a source of dust when exposed, to an area of beneficial use. Excellent aquatic wildlife habitat will be developed at the im-

poundments. A major new migratory waterfowl production area will be developed. Construction may result in some temporary turbidity in the lake and reservoir storage capacity will be reduced by less than one percent. Alternatives considered were no development and stabilizing the reservoir operating level. In the absence of a solution to the dust problem, the quality of life in the area will continue at a significantly lower level than if the dust problem were abated. (Waldron-Florida)
W72-14565

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14571

ANACOSTIA RIVER AND TRIBUTARIES, PRINCE GEORGES COUNTY, MARYLAND, LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-14574

UTILIZATION OF AN INPUT-OUTPUT MODEL FOR PREDICTING WATER DEMAND ON A SMALL WATERSHED,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 06A.
W72-14644

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-199 637-F, $3.00 in paper copy, $0.95 in microfiche. September 22, 1971. 25 p, 1 map, 1 dwg, 4 tab.

Descriptors: *Lake Erie, *Environmental effects, *Beach erosion, *Erosion control, Pennsylvania, Recreation, Public benefits, Beaches, Sand, Recreation facilities, Shores, Project benefits, Project purposes, Shore protection, Coastal engineering, Recreation demand.
Identifiers: *Environmental Impact Statements, *Presque Isle Peninsula (Pa).

The proposed project is a modification of a beach erosion control project on the south shore of Lake Erie at Erie, Pennsylvania. The purpose is to restore and improve 1500 linear feet of the public bathing beaches at a state park and to protect the lakeward perimeter of the peninsula from severe erosion. The proposed project modifications will only restore the beach to its condition at the time it was originally completed through sand replenishment. Therefore it should have no new impact on the local environment. The project will have no adverse environmental effects, except temporary restrictions on public use of the beach in the construction area. Alternatives include: utilization of continuation of the present method of beach replenishment using sand from the upland area, pumping sand from the area of natural accretion at the tip of the peninsula and recirculating it back to the beaches as needed, or abandoning the project entirely. Comments from interested agencies are included. (Brackins-Florida)
W72-14764

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

BARIUM AND STRONTIUM CONCENTRATIONS IN PACIFIC AND MEDITERRANEAN SEA WATER PROFILES BY DIRECT ISOTOPE DILUTION MASS SPECTROMETRY,
Institut de Physique du Globe, Paris (France).
M. Bernat, T. Church, and C. J. Allegre.
Earth and Planetary Science Letters, Vol 16, No 1, p 75-80, September 1972. 2 fig, 3 tab, 10 ref.

Descriptors: *Strontium, *Trace elements, *Sea water, *Mixing, Data collections, Water chemistry, Oceanography, Water analysis, Water circulation, Diffusion, Sampling, Distribution patterns.
Identifiers: *Barium, *Mediterranean Sea.

Determination of barium and strontium directly from sea water by isotope dilution mass spectrometry is an efficient, precise, and virtual blank-free procedure. Results for an eastern Pacific profile confirm a regularly increasing barium concentration from 5 to 23 micrograms/kg at 2500 m, but strontium concentrations appear to be nearly homogeneous below 50 m at 7.6 plus or minus 0.1 micrograms/kg with a single low value for the surface water. A western Mediterranean profile shows uniform concentrations for both barium and strontium, similar to the Atlantic. There appears to be a nearly conservative strontium-to-salinity ratio of 0.218 plus or minus 0.002 for sea waters below mixed surface zones. (Knapp-USGS)
W72-14222

DIGEST OF THE CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W72-14234

POTOMAC RIVER WATER QUALITY NETWORK: COMPILATION OF DATA.
Interstate Commission on the Potomac River Basin, Washington, D.C.

Report for Water Year 1971, 117 p, 2 fig.

Descriptors: *Potomac River, *Water quality, *Alkalinity, *Biochemical oxygen demand, *Chlorides, *Coliforms, Color, *Dissolved oxygen, Nitrites, *Nitrates, Nitrogen, Hydrogen ion concentration, *Phosphates, Flow rates, Pesticide residues, Water temperature, *Turbidity, Biota, Acidity, Sulfates, Manganese, Iron, Conductivity, Computer programs, Hydrologic data, Saturation, Suspended solids, Fish, Aquatic insects, Mullusks, Rivers, Bacteria, Data storage and retrieval.
Identifiers: *STORET, Shenandoah River, Anacosta River, Potomac River Basin, Dissolved solids, Rock Creek, Antietam Creek, Oxon Run.

The 1971 report on water quality of the Potomac River Basin is based on data obtained from samples taken at stream sampling points in the Basin. Ten selected parameters are recorded for each station but these vary from station to station. The data cover physical and chemical parameters as well as biota and coliform counts. The data reported were obtained from the STORET system, a multi-user computer system designed to manage water quality data in the most efficient and accurate way possible. Originally intended to handle only raw water quality data, STORET now handles municipal and industrial inventories, fish kill data, data plots, microfilming of data and other options. (Mortland-Battelle)
W72-14281

RESEARCH ON AND CULTURE OF CALCAREOUS GREEN ALGAE,
Ohio State Univ. Research Foundation, Columbus.
For primary bibliographic entry see Field 05C.
W72-14294

A SIMPLE MICROLAYER METHOD FOR SMALL SAMPLES,
Makapuu Oceanic Center, Waimanalo, Hawaii. Marine Ecology Div.
For primary bibliographic entry see Field 07B.
W72-14297

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES. A SURVEY OF THE LEAD CONTENT OF FISH FROM 49 NEW YORK STATE WATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
For primary bibliographic entry see Field 05C.
W72-14298

TECHNIQUE FOR MEASURING C-1402 UPTAKE BY SOIL MICROORGANISMS IN SITU,
Wisconsin Univ., Madison. Dept. of Bacteriology.
D. W. Smith, C. B. Fliermans, and T. D. Brock.
Applied Microbiology, Vol. 23, No. 3, p 595-600, March 1972. 3 fig, 1 tab, 12 ref.

Descriptors: *Soil microorganisms, *Absorption, *Carbon dioxide, *Radioactivity techniques, Soil algae, *Methodology, Measurement, Oxidation, Carbon radioisotopes, *On-site tests, Sulfur bacteria, Productivity, Radiochemical analysis, Thermophilic bacteria, Organic matter, Cultures, Soil bacteria.
Identifiers: Chemical interference, Scintillation counting, Cyanidium caldarium, Thiobacillus, Sulfolobus, Glucose, Uracil.

Uptake of C-1402 in soils due to algae or sulfur-oxidizing bacteria was examined by incubation of soil samples with gaseous C-1402 and subsequent chemical oxidation of the biologically fixed radioactive isotope to C-1402 for detection with a liquid scintillation counting system. The C-1402 was added to the soil in the gas phase so that no alteration of the moisture or ionic strength of the soil occurred. Wet oxidation of radioactive organic matter was carried out in sealed ampoules, and the C-1402 produced was transferred to a phenethylamine-liquid scintillation counting system with a simply constructed apparatus. The technique is inexpensive and efficient and does not require elaborate traps since several possible interfering factors were found to have no harmful effects. The efficiency of the technique in oxidizing various compounds was examined using varying concentrations of uniformly labeled glucose and uracil, and labeled Cyanidium caldarium cells. In all cases, the procedure was performed on samples containing 0.5 g of soil per ampoule to reproduce the treatment of natural samples as closely as possible. Sixty-one to eighty-seven percent of the added radioactivity was recovered during the oxidation of glucose and uracil, whereas 98 percent of the added radioactivity was recovered during the oxidation of C. caldarium. The recovery efficiency was independent of the amount of radioactivity present. Experiments in coal mine regions and in geothermal habitats have demonstrated the ecological applicability of this technique for measurement of CO_2 fixation by sulfur oxidizing bacteria and soil algae. (Long-Battelle)
W72-14301

METHOD FOR STUDYING GEOCHEMISTRY OF SEDIMENT-WATER INTERFACE,
Stockholm Univ. (Sweden). Dept. of Geology.
F. A. Schippel, R. O. Hallberg, L. E. Bagander, and A. G. Engvall.
AMBIO, Vol. 1, No. 2, p 71-72, April 1972. 6 ref.

Descriptors: *On-site data collections, *Geochemistry, *Sediment-water interfaces, *Phosphates, *Hypolimnion, On-site investigations, Anaerobic conditions, Degradation (Decomposition), Methodology, Aerobic conditions, Organic matter, Water pollution sources, Sampling, Model studies, Nutrients, Physicochemical properties, Hydrogen sulfide, Methane, On-site tests, Hydrogen ion concentration, Oxidation-reduction potential, Water temperature, Nitrites, Nitrates, Ammonia, Sulfides, Sulfates.
Identifiers: *Baltic Sea, Accumulation.

Accumulation processes in the bottom water of the Baltic Sea were simulated in order to obtain experimental data for computer simulation and prediction of the increase of the phosphate content of the bottom water and to obtain similar data for other substances. The experiments were performed in situ with a closed system apparatus, a plexiglass box. Sampling and other procedures took place through self-sealing rubber membranes. The boxes were equipped with electrodes for obtaining measurements of hydrogen ion activity (pH), redox potential (Eh) and sulphide ion activity (Es). The measurements were recorded continuously at a floating laboratory. Fourteen systems were in operation to study the effect of different additions of sulfate and organic matter at different temperatures. Reducing conditions were attained within the first 15 days of the experiment with decreases in sulfate, nitrate, nitrite, pH, Eh, Es. After 14 days when all the oxygen consumed, the aerobic organisms will die, the anaerobic bacteria will dominate the conditions in the closed boxes, and hydrogen sulphide, ammonia, methane and carbon dioxide will be produced during the decomposition of organic matter and the reduction of sulphate. Experiments where light was not admitted into the box gave the same results as those where light was admitted. Since the anaerobic bacteria are heterotrophic, the flux of mineral nutrients will principally depend on the amount of decomposable organic matter available. The effect of organic matter on the deep oxygen-free bottoms of the Baltic, which consist of nearly the same type of sediment as those studied, can therefore be simulated in the type of experiments that were conducted. Moreover, oxygenated conditions can be studied in a similar way. (Long-Battelle)
W72-14302

IDENTIFICATION OF N,O-DIMETHYHYDROXYLAMINE AS A MICROBIAL DEGRADATION PRODUCT OF THE HERBICIDE, LINURON,
Technische Hochschule, Munich (West Germany); and Bayerische Landesanstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschutz, Munich (West Germany).
G. Engelhardt, P. R. Wallnofer, and R. Plapp.

Descriptors: *Herbicides, *Microbial degradation, Chlorinated hydrocarbon pesticides, *Pollutant identification, Pesticide removal, Halogenated pesticides, Gas chromatography, Water pollution effects, Separation techniques.
Identifiers: *Bacillus sphaericus, *N,O-Dimethylhydroxylamine, *Linuron, Thin layer chromatography, Flame ionization gas chromatography, Substrate utilization, Fate of pollutants, 2 4-dinitro-1-fluorobenzene, 3- (3 4-dichlorophenyl)-1-methoxy-1-methylurea, 3 4-dichloroaniline.

Bacillus sphaericus, grown in the presence of linuron, produced as degradation products 3,4-dichloroaniline, carbon dioxide, and an unidentified product described as N,O-dimethylhydroxylamine (MHA). Linuron, 50 micrograms in 1.5 ml of phosphate buffer (pH 7.5), was incubated with 0.5 ml of cell free extract for 20 hr at 37 degrees C, and 95 percent of the linuron was degraded. MHA was identified by thin-layer chromatography and flame ionization gas chromatography. (Long-Battelle)
W72-14304

MICROBIOLOGY-DETECTION AND OCCURRENCE OF VIRUSES,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W72-14305

ION-EXCHANGE, COORDINATION, AND ADSORPTION CHROMATOGRAPHIC SEPARATION OF HEAVY-END PETROLEUM DISTILLATES,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
D. M. Jewell, J. H. Weber, J. W. Bunger, H. Plancher, and D. R. Latham.
Analytical Chemistry, Vol. 44, No. 8, p 1391-1395, July 1972. 2 fig, 2 tab, 13 ref.

Descriptors: *Separation techniques, Acids, Chemical analysis, Organic compounds, Pollutant identification, Cation exchange, Anion exchange, Mass spectrometry, Alkalis (Bases), Methodology, Aromatic compounds, Inorganic compounds, Oil.
Identifiers: *Crude oil, *Petroleum distillates, *Waste characterization, Aromatic hydrocarbons, Saturated hydrocarbons, Adsorption chromatography, Petroleum fractions, Mass spectra, Ion exchange chromatography, Coordination chromatography, Sample preparation, Column chromatography, Complexation, Polar compounds, Recovery, Ion exchange resins.

A separation scheme is described that divides heavy end petroleum distillates into acid, base, neutral-nitrogen, saturated and aromatic fractions and allows the removal of 'polar' nonhydrocarbon compounds. The acid and base fractions are removed by anion-and cation-exchange chromatographic techniques while the neutral-N fraction is obtained by coordination-complex formation with FeC13 on Attapulgus clay (ferric chloride coordination chromatography). Non-polar hydrocarbons are separated into saturate and aromatic fractions by adsorption chromatography using silica gel. The chromatographic methods have been applied to Wilmington, Wasson, Gato Ridge, Red Wash, and Recluse crude oils with good reproducibility (plus or minus 4 percent) and recovery (96 percent weight or better). Data are also presented from mass spectral analysis of saturate and aromatic fractions. (Mackan-Battelle)
W72-14306

NUCLEAR MAGNETIC RESONANCE SPECTROMETRY OF PETROLEUM FRACTIONS. CARBON-13 AND PROTON NUCLEAR MAGNETIC RESONANCE CHARACTERIZATIONS IN TERMS OF AVERAGE MOLECULE PARAMETERS,
Gulf Research and Development Co., Pittsburgh, Pa.
D. R. Clutter, L. Petrakis, R. L. Stenger, Jr., and R. K. Jensen.
Analytical Chemistry, Vol. 44, No. 8, p 1395-1405, July 1972. 10 fig, 6 tab, 6 ref.

Descriptors: *Nuclear magnetic resonance, Oil, Spectrometers, Chemical analysis, Pollutant identification, Carbon radioisotopes, Organic compounds, Aromatic compounds.
Identifiers: *Petroleum fractions, *C-13, Aromatic hydrocarbons, Alkanes, Alkenes, Petroleum distillates, Oil characterization, Paraffins.

Compositional characterization of petroleum distillates has been achieved by use of a modified Varian HA-60IL spectrometer, which provides CW carbon-13 nuclear magnetic resonance analysis with proton noise decoupling in the internal lock mode. Characterization was made in terms of up to 15 'average molecule' parameters for petroleum fractions such as: n - the average number of C atoms/alkyl substituent; R sub A - average number of aromatic rings/average molecule; and R sub S - the average number of alkyl groups/average molecule. The technique has been applied to several FCC charge stocks but their applicability is much wider. The advantages are: (1) they provide direct and accurate values of 'aromaticity' of a fraction, and (2) they afford excellent characterization of complex, multicomponent fractions as based on 'average molecule' parameters. (Mackan-Battelle)
W72-14307

AN EVALUATION OF THE GASPAK SYSTEM IN THE CULTURE OF ANAEROBIC BACTERIA,
Edinburgh Univ. (Scotland). School of Medicine.
J. G. Collee, B. Watt, E. B. Fowler, and R. Brown.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 71-82, March 1972. 3 fig, 6 tab, 22 ref.

Descriptors: *Cultures, *Anaerobic bacteria, *Methodology, Evaluation, Laboratory tests, Efficiencies, Gases, Measurement, Water pollution, Pollutant identification, Aqueous solutions, Incubation, Manometers, Pressure, Hydrogen, Carbon dioxide, Catalysts, Gages, Clostridium.
Identifiers: *Gaspak anaerobic procedure, Recovery, Spread plate method, Anaerobic jar procedure, Clostridium histolyticum, Clostridium bifermentans, Clostridium butyricum, Clostridium septicum, Vacuum gauges, Clostridium novyi, Phase contrast microscopy, Clostridium pedematiens, Clostridium sporogenes, Clostridium tetani, Bacteroides fragilis, Clostridium chauvoei, Bacteroides necrophorus, Clostridium welchii, Clostridium perfringens.

The efficiency of the Gaspak-system in comparison with a standard anaerobic jar procedure was investigated. The Gaspak envelope was prepared and its contents placed into a jar for incubation. Commercial vacuum gauges, simple mercury manometers, and large manometers were used for measurement of pressures, and the evolution of gas was measured in separate water displacement studies. Total counts of bacteria were performed by phase contrast microscopy and viable counts with a spread plate method. Comparable results were obtained with the commercially available disposable system for the production of H2 and CO2 in an anaerobic jar (the Gaspak system) and with the standard anaerobic jar procedure. Both systems were used with the Baird and Tatlock anaerobic jar and a room temperature catalyst. The test organisms included strict anaerobes such as Clostridium oedematiens type D and Cl. tetani. Comparative tests were also made with Bacteroides species from laboratory stock cultures and with freshly isolated strains of Bacteroides. On occasion, higher recoveries were obtained with the standard system when relatively demanding models were set up but it has limitations, having been developed initially for research purposes. The Gaspak system probably gives more reliable and more reproducible results in a laboratory in which experience with strict anaerobes is limited or sporadic. (Byrd-Battelle)
W72-14308

AN APPARATUS FOR DOSING LABORATORY FERMENTERS WITH SUSPENSIONS,
West of Scotland Agricultural Coll., Auchincruive (Scotland). Dept. of Bacteriology.
J. D. Owens, and M. R. Evans.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 91-97, March 1972. 4 fig, 1 tab, 2 ref.

Descriptors: *Instrumentation, *Laboratory equipment, *Cultures, Design, Fermentation, Slurries, Automatic control, Dissolved oxygen, Microbiology, Suspended solids.
Identifiers: Culturing vessels, Performance evaluation, Culture media.

The construction and operation of an apparatus for dosing laboratory fermenters semicontinuously with suspensions is described. The ap-

paratus periodically measures a volume of slurry and then injects it into the fermenter. A control unit determines how often the cycle of operations is performed. In order to determine the amount of variation in the concentration and volume of the aliquots of suspension delivered by the dosing unit, successive amounts were collected in flasks and the concentration of total solids was determined after drying at 105 degrees. To find out whether the volume delivered changed due to build up of material on the internal surfaces of the measure over a 24 h period, delivered volumes were collected on each of 2 successive days. The concentration of the suspension was measured at the start and the end of the trial to check that it had not changed. The results of the trial showed that the coefficient of variation for the concentrations of the delivered samples was 4.3 percent and that the mean concentration of the delivered suspension did not differ significantly from that ot the suspension in the reservoir. The coefficient of variation for the volumes of the aliquots was 3.3 percent and the mean volume delivered was similar on both days of the trial. (Snyder-Battelle)
W72-14309

A METHOD FOR THE RAPID ENUMERATION OF MYCOPLASMA SPECIES GROWING IN BROTH CULTURE,
East African Veterinary Research Organization, Kabete (Kenya).
R. S. Windsor, and C. D. H. Boarer.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 37-42, March 1972. 1 fig, 1 tab, 16 ref.

Descriptors: *Methodology, *Cultures, *Measurement, Microorganisms, Spectrophotometry, Pollutant identification, Freeze-thaw tests.
Identifiers: *Mycoplasma spp, *Enumeration, Culture medLactate dehydrogenase, Mycoplasma mycoides var mycoides.

The relationship of the mean lactate dehydrogenase (LDH) content of each organism to the number of viable organisms present proved to be a suitable method for the enumeration of Mycoplasma spp. in a growing culture. Newings tryptose broth and tryptose-serum agar were used for diluting organisms and for colony counts, respectively. The previously described method for determining LDH in cultures required spectrophotometric measurements of the decrease in absorption at 366 nm of NADH when it was oxidized by LDH in the presence of sodium pyruvate. Measurements of LDH were made on aliquots of the culture before and after disruption was only of value when cells were growing in the logarithmic phase. (Long-Battelle)
W72-14310

FLUORESCENT SPECTROPHOTOMETRY IN THE IDENTIFICATION OF BACTERIA,
Food and Drug Administration, Brooklyn, N.Y.
R. Ginell, and R. J. Feuchtbaum.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 29-36, March 1972. 7 fig, 7 ref.

Descriptors: *Pollutant identification, *Bacteria, *Fluorescent dye, *Mapping, Fluorescence, *Spectrophotometry, E. coli, Analytical techniques, Methodology, Salmonella, Enteric bacteria, Wavelengths, Chemical reactions.
Identifiers: *Fluorescence spectrophotometry, *Detection, Sarcina lutea, Acridine orange, Proteus mirabilis, Salmonella binza.

A fluorescent spectrophotometric technique for identifying bacteria involves using emission wavelength, excitation wavelength, and intensity to produce a topographic map characteristic of the fluorescence of the chemical bonds. Bacteria that had been cultured, washed, centrifuged and suspended in phosphate buffer were analyzed using a spectrophotofluorometer. The raw curves obtained were used to construct spectrofluorometric maps by recording successive scans of intensity versus emission wavelength for intervals of 10 nm in excitation wavelengths of 200-800 nm. Data obtained with Escherichia coli and Sarcina lutea showed the fluorescent portions of the bacteria to be inherently alike; however, upon dyeing with acridine orange, the differences (deviations in bonding) became apparent. This verifies the fact that dyes, such as acridine orange, can be used for enhancement of differences between species. Various improvements in the technique are presented. (Snyder-Battelle)
W72-14311

ON PRODUCTIVITY ESTIMATIONS OF RIVER WATER SAMPLES BY MEANS OF ALGAE TEST PROCEDURES,
Jena Univ. (East Germany). Biology Section.
For primary bibliographic entry see Field 05C.
W72-14314

THE IDENTIFICATION OF STREPTOCOCCI BY GAS-LIQUID CHROMATOGRAPHY,
Manchester University (England).
D. B. Drucker.
Microbios, Vol. 5, No. 18, p 109-112, March/April 1972. 1 tab, 20 ref.

Descriptors: *Streptococcus, *Pollutant identification, Gas chromatography, Separation techniques, Cultures, Esters, Isolation, Lipids, Organic compounds, Methodology, Aerobic bacteria.
Identifiers: *Gas liquid chromatography, *Waste characterization, Anteiso pentadecacanoate, Oleate, Stearate, Palmitoleate, Palmitate, Methylation (Chemical).

Ten strains of Streptococcus were identified by gas-liquid chromatographic (GLC) analysis which revealed patterns characteristic of fatty acid methyl esters produced by individual strains. Cells were grown on oxoid brain-heart infusion, with glucose as the carbon source. After growth, methyl esters of cells were produced by sealing 10 mg dry cells and 1 ml methylating reagent into ampoules under vacuum and heating to 100 degrees C for 3 hrs. Methyl esters were then extracted with 10 ml petroleum spirit (40-60 degrees C), and 3-microliter samples were analyzed by gas-liquid chromatography. (Long-Battelle)
W72-14316

PRODUCTIVITY OF THE BENTHIC MICROFLORA OF SHOAL ESTUARINE ENVIRONMENTS IN SOUTHERN NEW ENGLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W72-14317

ON THE DEPOSITION AND DISSOLUTION OF ZINC IN ALKALINE SOLUTIONS,
Pennsylvania Univ., Philadelphia. Electrochemistry Lab.
For primary bibliographic entry see Field 05B.
W72-14322

PHYSIOLOGICAL AND MORPHOLOGICAL EFFECTS OF PHENETHYL ALCOHOL UPON A GRAM-NEGATIVE MARINE PSEUDOMONAD,
Macdonald Coll., Sainte Anne de Bellevue (Quebec). Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-14323

A STUDY OF THERMOPHILIC AEROBIC SPOREFORMING BACTERIA ISOLATED FROM SOIL AND WATER,
Missouri Univ., Columbia. Dept. of Food Science and Nutrition.
For primary bibliographic entry see Field 05C.
W72-14324

APPARATUS FOR CONTINUOUS MEASUREMENT OF ACTIVE UPTAKE OF RADIOACTIVE SUBSTANCES,
Regensburg Univ. (West Germany).
E. Loos.
Analytical Biochemistry, Vol 47, No 1, p 90-101, May 1972. 6 fig, 1 tab, 8 ref.

Descriptors: *Laboratory equipment, *Radioisotopes, *Measurement, *Kinetics, *Absorption, Instrumentation, Radioactivity techniques, Carbon radioisotopes, Productivity, Metabolism, Fungi, Organic compounds, Chlorella, Tracers, Aquatic algae.
Identifiers: C-14, *Chlorella vulgaris, Neurospora crassa, Scintillation counting, Glucose, Membrane filters, Monosaccharides, Membrane filtration.

An apparatus consisting of a modified scintillation chamber, sample cell, and an end-on photomultiplier has been used to study the uptake kinetics of radioactive compounds (C-14-labelled 3-O-Methyl-D-glucose) by Chlorella vulgaris and conidia of Neurospora crassa. The apparatus is constructed so that the cells are held in a thin layer close to the scintillation crystal with the nutrient medium diffusing from above through a membrane filter. The medium is constantly stirred to minimize concentration gradients developed during uptake. Uptake rates are seen as an increase of measured radioactivity in the cells. For Chlorella a K sub m of 0.6 mM was found for the uptake. Parallel experiments with the membrane filter technique show good agreement and can be used to calibrate the apparatus. A diagram of the apparatus accompanies the description. (Mackan-Battelle)
W72-14326

ISOLATION AND CHARACTERIZATION OF ULTRAVIOLET LIGHT-SENSITIVE MUTANTS OF THE BLUE-GREEN ALGA ANACYSTIS NIDULANS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
Y. Asato.
Journal of Bacteriology, Vol 110, No 3, p 1058-1064, June 1972. 8 fig, 20 ref.

Descriptors: *Isolation, *Ultraviolet radiation, Separation techniques, Cyanophyta, Cultures, Antibiotics (Pesticides), Photoactivation, Aquatic algae, Environmental effects.
Identifiers: *Waste characterization, *Anacystis nidulans, *Mutants, *Sensitivity, Chloramphenicol, Recovery, Survival.

Three UV-sensitive mutants of the blue-green alga, Anacystis nidulans were isolated and characterized as to their ability to repair UV damage (photoreactivation). UV light-sensitive mutants, prepared by subjecting cells to UV radiation and replating the survivors, were isolated for study by treating exponential cultures with N-methyl-N'-nitro-N-nitrosoguanidine followed by centrifugation. The photoreactive ability of various A. nidulans mutants was determined under a variety of conditions which included exposing cells to chloramphenicol, caffeine, black and white fluorescent lights, and red lights. Strain uvs-1 was most sensitive to UV in the absence of photoreactivation. Pretreatment with caffeine suppressed the dark-survival curve of strain uvs-1, indicating the presence of excision enzymes involved in dark repair. Under 'black' and 'white' illumination, strain uvs-1 displayed photoreactivation properties nearly comparable to wild-type culture. Mutants uvs-35 and uvs-88 appeared to have partial photorecovery capacities. Upon pretreatment with chloramphenicol, photoreactivation properties of strains uvs-1 and uvs-88 were not evident although the partial photoreactivation characteristics of strain uvs-35 remained the same. Data indicate

that strains uvs-1, uvs-35, and uvs-88 are probably genetically distinct UV-sensitive mutants. (Long-Battelle)
W72-14327

QUARTZ CRYSTALS AS MULTIPURPOSE OCEANOGRAPHIC SENSORS - I. PRESSURE,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 07B.
W72-14330

QUARTZ CRYSTALS AS MULTIPURPOSE OCEANOGRAPHIC SENSORS - II. SPEED,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 07B.
W72-14331

THE CALIBRATION OF THERMISTORS OVER THE TEMPERATURE RANGE 0-30 DEGREES C,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 07B.
W72-14332

INTERACTIONS OF LIGHT AND INORGANIC NITROGEN IN CONTROLLING NITROGEN UPTAKE IN THE SEA,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W72-14333

INSTRUMENTATION FOR OCEANOGRAPHIC RESEARCH,
For primary bibliographic entry see Field 07B.
W72-14340

USE OF FIBER OPTICS IN THE STUDY OF CHEMILUMINESCENT REACTIONS,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
R. L. Brown.
The Review of Scientific Instruments, Vol 43, No 5, p 756-758, May 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Instrumentation, *Measurement, Chemical reactions, Calibrations, Light, Mathematics, Nitrogen, Methodology, Optical properties, On-site data collections, Attenuation.
Identifiers: *Fiber optics, *Chemiluminescence, Electron paramagnetic resonance spectroscopy, Detectors, Sensors.

The use of stationary light pipes and a stationary detector to measure light decay along a tube in a steady state flow system is described. This method exhibits a number of advantages over that of moving the detector. A means of calibrating the transmission of the light pipes in situ by using the properties of the yellow nitrogen afterglow is discussed. The high degree of spatial resolution achievable by this technique should make it especially suitable for studies of small flames and discharges. (Long-Battelle)
W72-14344

A HIGH PRESSURE OPTICAL CELL FOR STUDY OF BIOCHEMICAL SOLUTIONS,
Columbia Univ., New York. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02K.
W72-14345

SILICON, RADIUM, THORIUM, AND LEAD IN SEAWATER: IN-SITU EXTRACTION BY SYNTHETIC FIBRE,
Tata Inst. of Fundamental Research, Bombay (India).
For primary bibliographic entry see Field 02K.
W72-14353

SHIPBOARD ANALYSIS OF STRONTIUM-90 IN SEAWATER ON GEOSECS II,
W. J. Major, K. D. Lee, and R. A. Wessman.
Earth and Planetary Science Letters, Vol 16, No 1, p 138-140, September 1972. 1 tab, 4 ref.

Descriptors: *Water analysis, *Strontium radioisotopes, *On-site laboratories, Data collections, Sampling, Oceanography, Water chemistry, Radiochemistry, Tracers, Laboratory tests, Pollutant identification.

Strontium-90 in seawater samples was analyzed aboard the USS Knorr by direct extraction of the Y-90 daughter. The extraction was made in two 17-gallon heavy-walled glass bottles. Yttrium carrier was added and the Y-90 was extracted with HDEHP in toluene, back-extracted with HCl, and purified with a second HDEHP extraction. The Y was mounted as the oxalate and counted in a methane end window system. Check analyses were performed in a shore-based laboratory equipped with low background beta counters. The results of the sea and shore analyses were consistent within the limits of error. The test demonstrates that Sr-90 analyses can be performed satisfactorily at sea, and that a better equipped laboratory and counting facility would improve the performance considerably. (Knapp-USGS)
W72-14356

INDUSTRIAL WASTEWATER DISCHARGES.
New York State Dept. of Health, Albany. Div. of Pure Water.

June 1969. 60 p, 4 fig, 11 tab.

Descriptors: *Water sampling, *Water quality control, *New York, *Industrial wastes, *Water pollution, *Waste water disposal, Water quality standards, Analytical techniques, Water pollution control, Waste water (Pollution), Waste disposal wells.

Along with industry's right ot clean water comes their responsibility to return waste water in a condition that allows its continued use. This publication serves as a guide for local health departments and industries in New York State to set up and implement a program for measuring and reporting the extent of the pollution caused by their waste water discharges. Included are sections on selected analyses for surface water discharge and groundwater discharge, analytical procedures, New York laws on water pollution, and water quality standards. (Poertner)
W72-14444

THE ANALYSIS OF AROMATIC COMPOUNDS IN WATER USING FLUORESCENCE AND PHOSPHORESCENCE,
New Hampshire Univ., Durham. Water Resources Research Center.
D. W. Ellis.
Available from National Technical Information Service as PB-212 268, $3.00 in paper copy, $0.95 in microfiche. Completion Report, New Hampshire Water Resource Research Center, Durham, June 1972. 73 p, 12 fig, 21 tab. OWRR A-009-NH (4).

Descriptors: *Aeromatic compounds, *Fluorescence, Analytical techniques, Air pollution, Extraction, Separation techniques, Gas chromatography, Mass spectrophotometry.
Identifiers: *Polynuclear aromatic hydrocarbons, *Phosphorescence.

The presence of small amounts of polynuclear aromatic hydrocarbons (PNA) in many areas of the environment has focused attention on the development of improved analytical measurements for their determination. Much of this interest can be attributed to the fact that a substantial number of PNA have been shown to be highly carcinogenic. The major source of PNA in the environment is the incomplete combustion of coal and other fuels. As such PNA compose a significant percentage of chimney soot and coaltar pitch. Trace amounts of PNA have been found in association with a wide variety of other substances throughout the environment. Although most of these sources, such as airborne particulate matter or cigarette smoke, can be traced directly or indirectly to incomplete combustion, there is sufficient evidence to demonstrate that trace amounts of PNA are synthesized by naturally occurring organisms. The presence of PNA in air particulates has been firmly established and it is reasonable to assume that some are transported into the natural water system.
W72-14541

CHEMICAL STUDIES ON TOXINS FROM GYMNODINIUM BREVE AND APHANIZOMENON FLOS-AQUAE,
New Hampshire Univ., Durham. Dept. of Biochemistry.
For primary bibliographic entry see Field 05C.
W72-14542

THE FRAUNHOFER LINE DISCRIMINATOR: AN AIRBORNE FLUOROMETER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14613

LOSS OF MERCURY FROM WATER DURING STORAGE,
Environmental Health Lab., McClellan AFB, Calif.
R. V. Coyne, and J. A. Collins.
Analytical Chemistry, Vol 44, No 6, p 1093-1096, May 1972. 19 ref.

Descriptors: *Mercury, *Laboratory tests, *Sampling, *Water analysis, Water pollution.
Identifiers: *Mercury losses, *Sample storage, *Sample preservation, Polyethylene sample containers, Data interpretation, Nitric acid preservation.

There is no doubt that reported sensitivities for mercury in the parts per billion range are possible from a strictly analytical standpoint. However, as early as 1941, reference was made to adsorption of mercuric ions from dilute solutions onto glass surfaces, but no data were presented to support the statement. Data are presented on the stability of dilute solutions of mercury stored in polyethylene bottles and the rate of loss under routine conditions of sample handling is described. The losses of mercury can be severe, possibly leading to serious misinterpretations of the actual conditions. Since error in this case is always on the low side, it would seem appropriate to recommend extreme caution in the interpretation of results from a water sample over seven days old unless the sample handling conditions are accurately known. Of the preservatives studied, nitric acid to a final pH of 1 (about 10 ml/l of sample) seems to be the only one that is effective to any significant degree. (Oleszkiewicz-Vanderbilt)
W72-14620

LEVELS OF ANTIMONY, CADMIUM, CHROMIUM, COBALT, MANGANESE, AND ZINC IN INSTITUTIONAL TOTAL DIETS,
Food and Drug Administration. Cincinnati, Ohio.
G. K. Murthy, U. Rhea, and J. T. Peeler.
Environmental Science and Technology, Vol 5, No 5, p 436-442, May 1971. 1 fig, 6 tab, 35 ref.

Descriptors: *Foods, *Heavy metals, *Cadmium, *Chromium, *Cobalt, *Manganese, *Zinc, *Diets, Trace elements, Sampling.
Identifiers: *Institutional tat diet, *Antimony, *Body burden, Atomic absorption spectroscopy, Food consumption.

The average trace element content in the diets of children, aged 9 to 12, from different institutions, expressed as mg/kg of food, varied. Values were: antimony, 0.209 to 0.693; cadmium, 0.027 to 0.062; chromium, 0.175 to 0.472; cobalt, 0.252 to 0.693; manganese, 0.535 to 1.639; and zinc, 2.67 to 6.36. Similarly, the consumption of food varied from 1.18 to 2.55 kg/day and the milk content of diet varied from 9.5 to 63.8%. Statistical analyses of the data (mg/day) showed significant seasonal and geographical variations among the 28 U.S. cities sampled. The samples from Palmer, Alas., and Salt Lake City, Utah, had the lowest trace element concentrations, whereas the concentrations in those from Tampa, Fla., and Jackson, Miss., were consistently high. Monthly averages for all elements showed that cadmium was constant throughout the year and the other elements tended to peak in late spring or summer. The institutions ranged from well-to-do boarding schools to orphanages with severe economic limitations. (Oleszkiewicz-Vanderbilt)
W72-14622

DETERMINATION BY GAS LIQUID CHROMATOGRAPHY OF PHYSIOLOGICAL LEVELS OF CHROMIUM IN BIOLOGICAL TISSUES,
Vanderbilt Univ., Nashville, Tenn. School of Medicine.
G. H. Booth, and W. J. Darby.
Analytical Chemistry, Vol 43, No 7, p 831-834, June 1971. 3 fig, 2 tab.

Descriptors: *Chromium, *Gas chromatography, *Analytical techniques, Laboratory tests, *Pollutant identification.
Identifiers: *Laboratory procedures, *Biological tissues, Liver, Extraction procedures, Chromium recovery, Chromium concentration.

A gas-liquid chromatographic method for the analysis of chromium in complex biological tissues such as liver is presented. Following wet digestion of tissue, chromium is chelated with trifluoroacetylacetone and this complex analyzed on a gas-liquid chromatograph equipped with electron capture detectors. Minimal detectable concentration of Cr in liver is less than 20 ng Cr/g tissue. Recovery of added inorganic chromium or Cr51 from liver averaged 95%. This analytical method is applicable to a variety of tissues and permits determination of Cr in tissuesat levels encountered in physiological and deficiency states. (Oleszkiewicz-Vanderbilt)
W72-14624

TRACE METAL CHARACTERIZATION BY ANODIC STRIPPING VOLTAMMETRY,
Michigan Univ., Ann Arbor. School of Public Health.
K. H. Mancy.
Paper presented 6th International Water Pollution Research Conference, Jerusalem, Israel, June 18-23, 1972. Paper No 7, Section A, Session 13, June 20, 1972. 10 p, 4 fig, 14 ref.

Descriptors: *Metals, *Analytical techniques, *Electrochemistry, *Trace elements, Laboratory tests, Heavy metals, Aquatic environment, *Pollutant identification.
Identifiers: *Anodic stripping voltammetry, *Trace metals, *Differential techniques, *Electroanalytical techniques, ASV titration techniques, Metals interactions, Voltammogram, Labile metal complexes, Nonlabile complexes.

Among the various methods of metals analysis, electroanalytical procedures offer both advantages of in situ measurement and species characterization. In addition, they offer: (a) high sensitivity required for trace analysis, e.g. Anodic Stripping Voltammetry (ASV), (b) suitability for field operation and, (c) suitability for automation. Analytical feasibility of ASV for trace metal characterization in the aquatic environment is illustrated. The arbitrary classification of metal, into 'free', 'labile complexes' and 'nonlabile complexes' cannot be considered as a true metal specification. Yet it can be used to advantage to give an insight into whether the metals of interest are present in free or complex form and what are the rates and magnitudes of metal complex formation. This is particularly useful in estimating the rates and amounts of metal binding by certain organics in natural and waste waters and the competitive interactions between metals for organic complex formation. The use of differential ASV techniques with four-electrode systems makes the techniques more adaptable for environment measurement. The ability to measure in the presence of dissolved oxygen and background current compensation extend the use of ASV techniques to in situ analysis and continuous monitoring applications. (Oleszkiewicz-Vanderbilt)
W72-14626

A METHOD FOR ENVIRONMENTAL MERCURY POLLUTION CONTROL IN DEVELOPING AREAS,
Aarhus Univ. (Denmark). Inst. of Hygiene.
J. C. Hansen.
Presented at 6th International Water Pollution Research Conference, Jerusalen, Israel, June 18-23, 1972. Paper No 11, Session 6, Section C, June 20, 1972. 7 p, 1 fig, 4 tab, 29 ref.

Descriptors: *Mercury, *Laboratory tests, *Bioassay, Water pollution sources, Foods, Mortality, *Pollutant identification.
Identifiers: *Microbiological bioassay, *Antibacterial effect, *Dose-mortality curve, Methylmercury, Spectroscopy, Dilution technique, Dithizone extraction.

Highly technical or expensive methods for Hg analysis, such as neutron-activation-analysis or flameless atomic absorption are available to only a few laboratories. A method based upon microbiological testing permits analyses in the nanogram area with sufficient precision to serve as a screening test for mercury. Primary control can be decentralized and the tests can be carried out by laboratories which possess general bacteriological equipment. The principles of the method, based on maximum mortality effect on a Pseudomonas strain in varying dilutions are explained. The sample is wet ashed, extracted with dithizone then with KI into the water phase, diluted, inoculated with bacterial cells, and cultivated on Simon's citrate agar. The microbiological method permits the use of 10 g of organic material or 1 liter of water for the determination of 12.5 ng/g or 0.125 ng/ml mercury, and is thus suitable for foods, with a tolerance level of 50 ng/g as stated by FAO/WHO, and for environmental investigations. The method is compared with neutron-activation-analysis and spectrophotometric methods. Data on analysis of flour, kale powder, human hair and tissue of fish from different pollutional zones are presented. (Oleszkiewicz-Vanderbilt)
W72-14627

THE ENRICHMENT OF HEAVY METALS IN SUBMERGED PLANTS,
Ruhrverband, Essen (West Germany).
For primary bibliographic entry see Field 05C.
W72-14629

IMPROVEMENTS IN THE DETERMINATION METHOD OF METHYL MERCURY IN FISH TISSUES AND THE RATIO OF METHYL MERCURY TO TOTAL MERCURY IN FISH TISSUES,
Kanagawa Prefectural Environmental Control Center, Yokohama (Japan).
S. Fukui, K. Tanaka, S. Kanno, and T. Ukita.
Presented at 6th International Water Pollution Research Conference, Jerusalem, Israel, June 18-23, 1972. Paper No 27, Section C, Session 13, June 22, 1972. 9 p, 4 fig, 4 tab, 1 ref.

Descriptors: *Mercury, *Analytical techniques, *Laboratory equipment, Fish, Water pollution effects, Separation techniques, Pollutant identification.
Identifiers: *Methylmercury, *Total mercury, Laboratory procedures, *Fish tissue analysis, Atomic absorption, Automatic extraction apparatus, *Spearfish, *Albacore.

The experimental conditions necessary to obtain the correct results on the determination of the ratio of methylmercury to total mercury in fish tissues were found. Using papaine digestion, an automatic extraction procedure and the internal standard method, reproducibility can always be obtained in each step of the determination procedure. The step by step laboratory procedure for the new method has been presented, followed by a comparison between the FDA method and the modified method. In the FDA method, the recovery of mercury seems to be changed with each sample. The cause might be the emulsion formed in directly treating fish tissues with benzene. The modified method overcomes these difficulties. The recovery of mercury added to the fish tissue is almost always 90 plus or minus 2%. The ratio of methylmercury to total mercury in one sample of the spearfish was 80.3% and in albacore, 66.6%. (Oleszkiewicz-Vanderbilt)
W72-14630

MERCURY: ITS HISTORICAL PRESENCE IN NEW YORK STATE FISHES,
New York State Dept. of Environmental Conservation, Rome. Rome Pollution Lab.
For primary bibliographic entry see Field 05C.
W72-14632

ROTATING RING-DISK STUDY OF THE REDUCTION OF OXIDIZED PLATINUM BY MERCUROUS MERCURY AND ITS ADSORPTION ON REDUCED PLATINUM,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W72-14634

CHEMICAL METHYLATION OF INORGANIC MERCURY WITH METHYLCOBALAMIN, A VITAMIN B12 ANALOG,
Tokyo Univ. (Japan). Faculty of Pharmaceutical Sciences.
For primary bibliographic entry see Field 05B.
W72-14635

GAS CHROMATOGRAPHIC DETERMINATION OF ORGANIC MERCURY COMPOUNDS BY EMISSION SPECTROMETRY IN A HELIUM PLASMA,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
C. A. Bache, and D. J. Lisk.
Analytical Chemistry, Vol 43, No 7, p 950-952, June 1971. 1 fig, 3 tab, 38 ref.

Descriptors: *Gas chromatography, *Mercury, Spectroscopy, Fish, Analytical techniques, Laboratory tests, *Pollutant identification.
Identifiers: *Methylmercury, Helium plasma.

The gas chromatographic detection of organic compounds containing sulfur, phosphorus, and halogens by emission spectrometry in a

microwave powered inert gas plasma was devised by McCormack et al. The technique was extended here for the determination of organic mercury compounds. Gas chromatographic operating parameters are listed in a table. Preliminary testing for total mercury was done with atomic emission spectrometry. Analysis of methylmercury on Lake Erie Coho salmon is made. The percentage recoveries agree with those of Westoo who found approximately a 30 percent loss of methylmercuric salts in this procedure due to unfavorable partition coefficients. The estimated sensitivity of the method for methylmercuric chloride in fish is about 0.05 to 0.1 ppm depending on the control value. (Upadhyaya-Vanderbilt)
W72-14636

MERCURY POLLUTION: THE MAKING OF AN ENVIRONMENTAL CRISIS,
Massachusetts Inst. of Tech., Cambridge. Lab. of Nuclear Science.
For primary bibliographic entry see Field 05C.
W72-14637

THEORY AND USE OF ION-SPECIFIC ELECTRODES (IONENSPEZIFISCHE ELEKTRODEN--THEORIE UND ANWENDUNG),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
H. Baumung.
In: Methodik der Untersuchung von Abwasser und Vorfluter, Munchen und Wien, p 271-283, 1971. 4 fig, 1 tab, 37 ref.

Descriptors: *Analytical techniques, *Measurement, *Equipment, *Electrodes, *Ions, Theoretical analysis, Application equipment, *Pollutant identification, Mineralogy, Sulfides, Magnesium.
Identifiers: Glass electrodes, Sulfide electrodes, Calcium electrodes.

Analytical measuring techniques have received new impetus due to the development of ion-specific electrodes. Regardless of this substantial increase, the development of these electrodes is still in the stage of infancy. New ion-specific electrode materials have been discovered and researched which will further the increase in the future. Experiments are underway to develop specific electrodes for analytically unique types of ions. The theory and application of ion-specific electrodes are discussed, including: glass electrodes for analysis of wastewater, receiving waters, minerals in estuaries, boiler plants and power stations; sulfide electrodes for sulfide and hydrogen sulfide determination in sediments; and calcium electrodes for determination of magnesium in seawater and for recording water hardness. (Brown-PAI)
W72-14667

ASPECTS TO BE CONSIDERED IN THE DETERMINATION OF TOTAL RADIOACTIVITY, ITS MEASURING AND SPECIAL BETA--SPECTROMETRIC PROCESS, (GESICHTSPUNKTE BEI DER PROBENAHME ZUR ERMITTLUNG DER GESAMT-RADIOAKTIVITAT, DEREN MESSUNG UND SPEZIELLE BETA--SPEKTROMETRISCHE VERFAHREN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
K. Hubel.
In: Methodik der Untersuchung von Abwasser und Vorfluter, Munchen und Wien, p 201-221, 1971. 12 fig, 1 tab, 15 ref.

Descriptors: *Radioactivity, *Spectrography, *Water quality, Hydrobiology, Metabolism, Absorption, Mud, Fish, Plant pathology, Pollutant identification.
Identifiers: alpha-radiation, beta-radiation, gamma-radiation, *beta-spectrometric process.

Methods to determine the total radioactivity of water samples using beta-spectrometric methods are discussed. Studies of surface water systems showed that water tests alone are not sufficient and a study of hydrobiological materials is imperative. Due to the metabolism and absorption of active nuclides that takes place, investigation of mud, fishes and water plants is necessary. Naturally as well as artificially induced radioactive isotopes, alpha, beta and gamma radiation are discussed. Cosmic radiation and nuclear reaction are not mentioned. Various techniques and equipment are described. (Brown-PAI)
W72-14668

INVESTIGATIONS INTO THE DISTRIBUTION OF INORGANIC NITROGEN COMPOUNDS IN RELATION TO THE INCREASING DETERIORATION OF THE WATER IN THE BALTIC SEA (UNTERSUCHUNGEN UBER DIE VERTEILUNG DER ANORGANISCHEN STICKSTOFFVERBINDUNGEN I M HINBLICK AUF DIE ZUNEHMENDE WASSERVERSCHLECHTERUNG IN DER OSTSEE),
Deutsche Akademie der Wissenschaften zu Berlin, Rostock (East Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 05B.
W72-14674

PETROLEUM: TAR QUANTITIES FLOATING IN THE NORTHWESTERN ATLANTIC TAKEN WITH A NEW QUANTITATIVE NEUSTON NET,
Dalhousie Univ., Halifax (Nova Scotia).
B. F. Morris.
Science , Vol 173, p 430-432, 30 July 1971. 2 fig, 2 tab, 8 ref.

Descriptors: *Oil pollution, Water pollution, Analytical techniques, Oily water, Oil spills, *Oil wastes, *Atlantic Ocean, *Pollutant identification.
Identifiers: *Tar, *Neuston net, Oil tar lamps.

The neuston net has been modified to obtain quantitative samples of surface zooplankton. Petroleum lumps are commonly taken with these nets, and quantities of tar up to almost 1.0 gm (wet weight) per cubic meter of filtered surface water have been taken in the northwestern Atlantic Ocean. This information is used to estimate the quantity of tar lumps present in the North Atlantic and to indicate the probable limits of the degree of existing oil pollution in this region. It is suggested that previous estimates of ocean oil pollution may be too low. (Svensson-Washington)
W72-14693

TISSUE CULTURE BIOASSAY METHOD FOR WATER POLLUTION WITH SPECIAL REFERENCE TO MERCURIC CHLORIDE,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
M. F. Li, and G. S. Traxler.
Journal of the Fisheries Research Board of Canada, Vol 29, No 5, p 501-505, 1972. 5 fig, 1 tab, 13 ref.

Descriptors: *Mercury, Water pollution, *Bioindicators, *Bioassay, Water quality, *Monitoring, Methodology, Public health, Aquatic environment, Aquatic life, Industrial wastes, Respiration, Cytological studies, *Pollutant identification, Industrial wastes, Municipal wastes.
Identifiers: *Mercuric chloride, Cell multiplication, Cell physiology.

The effect of HgC12 on multiplication and respiration of mouse cells (L-cells, clone 929) cultivated in suspension was studied. The nutritional history, growth phase and initial density of the cells, as well as the concentration of the serum supplement used in the test medium had significant effects on the sensitivity of the bioassay system. It was concluded that the cells used for the test should be in the stationary phase at an initial cell density of approximately 200,000/ml, and the test medium should be free of fetal calf serum. Under these experimental conditions mercuric chloride at a concentration of 10 micrograms/liter or less inhibited the cellular multiplication significantly; the results indicated that this assay procedure could be adequate for monitoring water quality. The cellular respiration method, however, was less sensitive, but simple and rapid with results available within a few hours. Therefore, they are useful for screening or preliminary testing of heavily polluted samples. (Svensson-Washington)
W72-14700

WATER POLLUTION SURVEYS AS A GUIDE TO INDUSTRIAL POLLUTION CONTROL,
Canadian Industries, Ltd., Montreal (Quebec). Engineering Dept.
N. E. Cooke.
Water and Pollution Control, p 20-23, 50, May 1971. 4 fig, 6 ref.

Descriptors: *Bioindicators, *Pollutant identification, *Benthic fauna, *Monitoring, Analytical techniques, *Water quality control, Invertebrates, Aquatic animals, Baseline studies, Water pollution, Mathematical studies, Graphical methods, Least squares method, Oligochaetes, Mollusks, Control systems.
Identifiers: Control charts, *Industrial pollution monitoring, Analysis of variance, Chironomids, Fly larvae.

Biological surveys based on the numbers of various types of invertebrate animals living in one square foot of the bottom sediments can be used to indicate if some harmful material has entered the water. The general concept is that of the control chart. Two types of charts have been developed. One is for use in unpolluted water. The other is for use in rivers where upstream pollution is present. The mathematics involved in determining the control limits in both these cases is discussed. (Svensson-Washington)
W72-14707

MONITORING OF ORGANO-CHLORINE RESIDUES IN FISH FROM AROUND ENGLAND AND WALES, WITH SPECIAL REFERENCE TO POLYCHLORINATED BIPHENYLS (PCBS),
Ministry of Agriculture, Fisheries and Food, Burhham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W72-14711

THE LEVELS OF CERTAIN METALS IN FISH FROM COASTAL WATERS AROUND ENGLAND AND WALES,
Ministry of Agriculture, Fisheries and Food, Burhham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05C.
W72-14712

BIOLOGICAL MONITORING OF THE EFFLUENT FROM A LARGE CHEMICAL WORKS IN A RIVER WHICH HAS SOURCES OF POLLUTION UPSTREAM,
Canadian Industries, Ltd. Montreal (Quebec). Engineering Dept.
N. E. Cooke, R. M. Cooper, and T. W. Beak.
Presented at Proceedings, 5th International Water Pollution Research Conference July-August 1970, p I-28/1 - I-28/6, Published in 1971. 2 fig, 4 ref.

Descriptors: *Bioindicators, *Pollutant identification, Water quality, *Benthic fauna, *Monitoring, Methodology, Analytical techniques, Invertebrates, Aquatic animals, Water pollution sources, Graphical methods, Oligochaetes, Mollusks, Control systems, Gastropods, Industrial wastes, Effluents.

Identifiers: *Industrial pollution monitoring, Control charts, Chironomids, Fly larvae, St. Clair River.

An effluent from a new plant was being discharged into the St. Clair River where there was already considerable pollution. To complicate the development of a system to monitor the effluent from the new plant, the existing pollution in the river was of a random nature indicating that there were intermittent discharges or spills of pollutants from upstream industries. To detect and recognize a meaningful signal in the presence of a large amount of static noise is a difficult task. That is what is accomplished by the method reported. The method of basing control charts on the differences in the number of animals found at stations upstream and downstream from the outfall being monitored permits one to detect a significant change caused by material discharge d through the outfall in spite of fluctuations in the number of animals caused by random discharges of polluting material discharged upstream. The method also clearly indicates those times where the changes in the number of animals have not been caused by discharges through the outfall being monitored but are only caused by other discharges upstream. (Svensson-Washington)
W72-14713

MONITORING MERCURY VAPOR NEAR POLLUTION SITES.
Environmental Measurements, Inc., San Francisco, Calif.

Copy available from GPO Sup Doc, $0.70; microfiche from NTIS as PB-212 370, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, May 1971. 66 p, 30 fig, 8 tab, 17 ref. EPA Program 16020 GLY 05/71.

Descriptors: Water pollution sources, *Mercury, *Pollutant identification, *Analytical techniques, Surveys, Remote sensing, Prototype tests, *Air pollution, Distribution patterns, Measurement, *California, Path of pollutants.
Identifiers: *Barringer Airborne Mercury Spectrometer.

Field and laboratory measurements were made to demonstrate that mercury vapor in the air near mercury-polluted water or sediment can be detected using an extremely sensitive detector, the Barringer Airborne Mercury Spectrometer. Areas were visited where the presence of mercury was known from fish, water, or sediment analyses; anomalous mercury levels ranging from 50 to more than 20,000 nanograms per cubic meter (ng/M3) were detected. Ambient air contained from 0 to 50 ng/M3. Anomalous concentrations of atomic mercury vapor in air may be classified as natural or man-made. The largest anomaly detected was natural, emanating from a steam vent at the Geysers, California. The second largest was man-made, and was measured downwind from a large chemical plant. Laboratory studies demonstrated that the mercury spectrometer is sensitive only to atomic mercury. By means of pyrolysis or combustion, organic compounds could be converted to metallic form and detected. To detect mercury pollution in water, pyrolysis appears necessary to convert combined mercury to the atomic state for measurement by rapid spectrophotometric techniques. (Eagle-Vanderbilt)
W72-14714

THE USE OF PHOTOGRAPHY IN WATER QUALITY RESEARCH,
Washington State Univ., Pullman.
W. H. Funk, and D. C. Flaherty.
Photographic Applications in Science, Technology and Medicine, Vol 7, No 5, p 20-22, September 1972. 7 fig, 1 ref.

Descriptors: Surveys, *Aerial photography, Water pollution effects, Eutrophication, *Lakes, Algae, Infrared radiation, *Remote sensing, *Pollutant identification, Aquatic weeds, *Washington, *Chlorophyll, Water temperature, Alkalinity, Dissolved oxygen, Conductivity, Hydrogen ion concentration.
Identifiers: *Snake River (Wash).

The first step in aerial photographic studies of lakes has been to make an aerial photographic survey of the particular lake or reservoir which has been scheduled for investigation. This helps to give the investigators a comprehensive picture of the lake environment in terms of its drainage basin, surface outlets, aquatic growth, possible nutrient sources and size in relation to other hydrographic features of the area. This initial aerial survey is followed by or conducted simultaneously with infrared photography of the lake and its environs. One of the characteristics of this material is that the chlorophyl of living algae and aquatic weeds is captured on the film in vivid pinkish red hues, whereas dead algae or vegetation exhibit a whitish or yellowish orange appearance. Aerial reconnaissance has made it possible to survey eight to ten lakes in a two-state area in a single day. On sampling trips, light penetration, water temperature, dissolved oxygen, pH, alkalinity, and conductivity tests are made at various depths. Two-liter water samples are also collected for plankton and chemical analysis. A current project involving water quality surveillance is a study of 150 miles of the Lower Snake River drainage area located in southeastern Washington. Aerial photography shows that this stretch of the river is subjected to excessive runoff of topsoil shortly after the snow melts in the spring, and also during periods of high rainfall. (Knapp-USGS)
W72-14728

BEHAVIOR OF BERYLLIUM SULFATE IN HARD AND SOFT WATER,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 05B.
W72-14744

NUTRIENT SURVEY OF SURFACE WATERS IN SOUTHERN FLORIDA DURING A WET AND A DRY SEASON, SEPTEMBER 1970 AND MARCH 1971,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14750

AN IMPROVED SEPARATION AND DETERMINATION OF URANIUM IN SEAWATER,
Hawaii Univ., Honolulu. Dept. of Chemistry; and Hawaii Inst. of Geophysics, Honolulu.
Gregory Leung, Young. S. Kim, and Harry Zeitlin.
Analytica Chimica Acta, Vol. 60, p. 229-232, 1972.

Descriptors: Separation techniques, *Sea water, Fluorescence, Surfactants, Fluorescent dye, Spectrophotometry, Anions, Trace elements, Analytical techniques.
Identifiers: *Uranium, Thorium-hydroxide.

Whether the use of thorium hydroxide coupled with the measurement of fluorescence intensity of the uranium-Rhodamine B complex would lead to improvement in recovery and increase in sensitivity of the determination of uranium in seawater was investigated. Fluorescence intensity was measured with a Beckman DU spectrophotometer with a fluorescence attachment. Flotation procedure separated the uranium; thorium nitrate solution was added to samples of filtered seawater containing uranium. The pH, around 5.7, was adjusted with 1 M hydrochloric acid and the sample was transferred to the flotation cell. Maximal recovery had been obtained at this pH in a comparable study. The sodium dodecyl sulfate surfactant failed to float the colloidal thorium hydroxide to the surface. A clean separation and stable froth were achieved by substitution of sodium dodecanoate as the surfactant. By use of sodium dodecanoate and thorium hydroxide the recovery of uranium from seawater based on that added was improved to about 91%. The absorption and fluorescence spectra are shown and the sensitivity of the two methods was compared; results indicate that fluorescence intensity gives better sensitivity. This study confirms a previous communication that adsorbing colloid flotation may be of general applicability for separation of many trace metallic ions through selection of the proper surfactant-collector from seawater. (Jones-Wisconsin)
W72-14798

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF POLYCHLORINATED BIPHENYLS,
National Institute of Environmental Health Sciences, Research Triangle Park, N.C.
For primary bibliographic entry see Field 05C.
W72-14804

THE VELOCITY DEPENDENCE OF THE TOTAL CROSS SECTION FOR ALKALI--WATER SCATTERING,
Connecticut Univ., Storrs. Inst. of Water Resources.
E. Pollack, and T. I. Moran.
Available from the National Technical Information Service as PB-212 362, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1972. 3 p, 1 tab, 2 ref. OWRR A-023-CONN (2).

Descriptors: *Molecular structure, *Attenuation, *Ionization, *Potassium, *Cesium, Velocity, Deflection, Alkalinity, Alkaline water.
Identifiers: *Alkali water systems, *Atomic beam scattering, Beam velocity, Potential energy, Internuclear separation, *Rubidium.

The long range interactions between K, Cs, Rb atoms and water molecules were studied using atomic beam scattering techniques. The alkali beam was thermally generated, subsequently velocity filtered, and directed upon target water molecules. The ensuing collisions between the incident alkali atoms and water molecules result in a diminution of alkali beam intensity at the beam detector. Measurements of the amount of alkali beam attenuation resulting from collision (and deflection) of the alkali beam as a function of the beam velocity provides the experimental information from which is obtained the power of r in the expression for the interaction potential V (r)-c-/r to the s power. Results are reported for each of the alkali-water systems. The values of s are 6.00, 5.88 and 6.13 for K, Rb, and Cs respectively.
W72-14838

A CHEMICAL ANALYSIS OF THE EARTHY--MUSTY ODOR IN WATER,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. P. Collins.
Available from the National Technical Information Service as PB-212 365, $3.00 in paper copy, $0.95 in microfiche. Completion Report, July 1972. 3 p, 4 ref. OWRR A-032-CONN (1).

Descriptors: *Acetinomycetes, *Odor, *Gas chromatography, *Spectrophotometry, Microorganisms, Water quality, Chemical analysis.
Identifiers: *Streptomyces odorifer, 2-exo-hydroxy-2-methylbornane, Trans-1, 10-dimethyl-trans-decalol, Cadin-4-ene-l-ol, *Earthy-musty odor, Thames River salmon, Aroma-inducing constituents.

The earthy-musty odor complex induced by Streptomyces odorifer has been studied. The major aroma inducing constituents have been

identified as 2-exo-hydroxy-2-methylbornane, trans-1, 10-dimethyl-trans-decalol, and cadin-4-ene-1-ol. The identifications were based on gas chromatographic and thin-layer chromatographic procedures as well as infrared and mass spectrometry.
W72-14841

SOLUBILIZING EFFECTS OF AMIDE-WATER MIXTURES,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. E. Lindstrom.
Available from the National Technical Information Service as PB-212 367, $3.00 in paper copy, $0.95 in microfiche. Completion Report June 1972. 9 p, 1 tab, 4 fig. OWRR-A-049-CONN (1).

Descriptors: *Amino acids, *Aqueous solutions, *Peptides, *Solubility, Pesticides.
Identifiers: *Amides, *Amide-water mixtures, *Apparent molar volumes, *Methyl parahydroxybenzoate, *Dilatometry, Parabens, Dimerization, Solubility of nonelectrolytes.

The solubility of methyl paraben in various amide-water mixtures was measured at 25.0 degrees Centigrade. The paraben solubility increases exponentially above an amide concentration corresponding to the point at which the amide apparent molar volume passes through a minimum. A model for the observed phenomena was proposed on the basis of data from solvent systems which included sixteen amides and various of their aqueous mixtures. The model proposes the formation of amide aggregates which (i) increase in size and complexity with the amide concentration; and (ii) lead to a greatly enhanced solubilizing power for the binary amide-water co-solvent system.
W72-14843

POLLUTION INSTRUMENTATION TECHNIQUES,
Union Carbide Corp., South Charleston, W. Va.
L. G. Cochran, J. P. Gay, H. N. Hill, Jr., and R. C. Lawrence.
Chemical Engineering Progress, Vol 68, No 8, p 76-79, August 1972. 4 fig, 2 ref.

Descriptors: *Pollution abatement, *Industrial wastes, *Pollutant identification, Chemical oxygen demand, Water pollution control, *Monitoring, *Instrumentation, Costs, Chromatography, Spectrophotometry.
Identifiers: *Carbon analyzer.

The result of a river cleanup program began in 1958 along the Kanawha River has been the development of several pollution instrumentation techniques. Union Carbide employs in-plant monitoring of waste effluent by using chromatographs, carbon analysis, chemical oxygen demand apparatus and a Perkin Elmer atomic absorption spectrometer. These systems permit instant warning of harmful spills in the plant. In addition to improving their relationship with the community and reducing pollution hazard, the Union Carbide program and techniques have paid for themselves by reducing the loss of expensive products and/or raw materials. (Smith-Texas)
W72-14855

METHYLATION OF MERCURY BY MICROORGANISMS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
L. W. Parks, and E. M. S. MacDonald.
Available from the National Technical Information Service as PB-212 386, $3.00 in paper copy, $0.95 in microfiche. Technical Research Project Termination Report, 1972. 22 p, 2 fig, 5 tab, 18 ref. OWRR A-015-ORE (1).

Descriptors: *Mercury, *Analytical techniques, *Separation techniques, Chelation, Resins, Inorganic compounds, Organic compounds.
Identifiers: Dithizone method.

Both organic and inorganic forms of mercury are analyzed by a modification of the classical dithizone method in the range 0-50 microgram. The separation of mercury from the bulk of interfering ions such as Cu++, Fe+++, Bi+++, Mg++, Ca++ and Na+ can be accomplished simply by use of chelating resins. No satisfactory method of separating inorganic mercury compounds from organomercurial compounds by differential elution was found. Mercury is not appreciably volatile in hot oxidizing acidic solution and the elaborate refluxing systems of the standard dithizone method are unnecessary.
W72-14921

AN ANALYSIS OF THE CONCENTRATIONS OF HEAVY METALS IN MONTEREY HARBOR UTILIZING THE METHODS OF ATOMIC ABSORPTION SPECTROPHOTOMETRY AND POLAROGRAPHY,
Naval Postgraduate School, Monterey, Calif.
J. W. Tanner.
Available from the National Technical Information Service as AD-738 889, $3.00 in paper copy, $0.95 in microfiche. M Sc Thesis, Naval Postgraduate School, December 1971. 41 p, 6 fig, 3 tab, 15 ref.

Descriptors: *Chemical analysis, *Heavy metals, *Sea water, *Coasts, *California, Analytical techniques, Harbors, Spectrophotometry, Polarographic analysis, Evaluation, Methodology, Breakwaters, Environmental effects, Ecology, Sampling, Cobalt, Copper, Iron, Lead, Nickel.
Identifiers: Pre-construction study.

In 1972 or 1973 construction may begin on a breakwater to be located off of Del Monte Beach north and east of the present Municipal Wharf No. 2 in Monterey, California. Faculty and students of the Naval Postgraduate School have undertaken to describe the ecology of this area before construction begins. Ecological base lines in the undisturbed area will be established so that environmental changes brought about by harbour construction can be evaluated. As part of this study, water samples were taken at selected stations and analyzed for the heavy metals cobalt, copper, iron, lead, and nickel by atomic absorption spectroscopy and by polarography. The results obtained by these two methods are compared and discussed. The heavy metals in the sea water were concentrated and removed using the ammonium pyrrolidine dithiocarbamate (APDC) -- methyl isobutyl ketone (MIBK) solvent extraction method. The concentrations of the metals were determined using atomic absorption spectrophotometry. The APDC-MIBK solvent extraction method was not adequate for analysis by polarographiy. (Woodard-USGS)
W72-14964

USE OF X-RAY FLUORESCENCE TO DETERMINE TRACE METALS IN WATER RESOURCES,
Dayton Univ., Ohio. Dept. of Physics.
M. B. Blasius, S. J. Kerkhoff, R. S. Wright, and C. R. Cothern.
Water Resources Bulletin, Vol 8, No 4, p 704-714, August 1972. 11 fig, 1 tab, 38 ref.

Descriptors: *Trace elements, *Water analysis, *X-ray fluorescence, X-ray analysis, Fluorescence, Sampling, Water chemistry, Ion exchange, Water quality, Pollutant identification.
Identifiers: Ion exchange filter paper.

The X-ray fluorescence method may be used to analyze trace metals collected in particulate form on filter papers and from the ionic state by ion exchange filter papers. The samples are prepared by allowing water to pass through these filter papers. The procedures necessary for using the X-ray fluorescence method are described. A number of samples were taken from the Great Miami River in Dayton, Ohio over one year, showing the presence of Ca, Ti, Cr, Fe, Cu, Zn, Sr, and Cd. Elements in the periodic table between Ti and Cs were detectable to a sensitivity limit of the order of 30 ppb for metals in the particulate form and 0.4 ppm for metals in the ionic form. (Knapp-USGS)
W72-14965

5B. Sources of Pollution

BERYLLIUM-7 AND FISSION PRODUCTS IN THE GEOSECS II WATER COLUMN AND APPLICATIONS OF THEIR OCEANIC DISTRIBUTIONS,
W. B. Silker.
Earth and Planetary Science Letters, Vol 16, No 1, p 131-137, September 1972. 4 fig, 1 tab, 19 ref.

Descriptors: *Tracers, *Water circulation, *Atlantic Ocean, *Trace elements, *Radioisotopes, Fallout, Oceanography, Ocean currents, Distribution patterns, Data collections, Beryllium, Zinc, Cesium, Thermocline, Sampling, Water analysis.

Vertical concentration gradients of Be-7 and ZrNb-95 in the Atlantic Geosecs II water column showed the vertical eddy diffusion coefficient to be 1.2-1.35% cm/sec through the top sixty meters of the thermocline. Lower values of the diffusion coefficient calculated from the longer-lived nuclides Ru-106 and Ce-144 suggests horizontal-transport of the deeper water from areas of lower fallout levels. Temporal and spatial oceanic distributions of Be-7 were analyzed with respect to their application for use in predicting deposition of other radionuclides which are present in the atmosphere. The ratios of air concentrations of radioactive tracers, together with known variations of Be-7 in the ocean can be applied in the development and proof of a dynamic model of oceanic circulation and transport. (Knapp-USGS)
W72-14220

TRITIUM PROFILE AT THE ATLANTIC 1970 GEOSECS TEST CRUISE STATION,
Heidelberg Univ. (West Germany). Institut fuer Angewandte Physik.
W. Roether, and K. O. Munnich.
Earth and Planetary Science Letters, Vol 16, No 1, p 127-130, September 1972. 1 fig, 1 tab, 12 ref.

Descriptors: *Sea water, *Atlantic Ocean, *Tritium, *Water chemistry, Water analysis, Radiochemistry, Geochemistry, Oceanography, Data collections, Sampling, Provenance, Mixing, Tracers, Trace elements, Water circulation, Ocean currents.

Tritium concentrations at the Atlantic Geosecs station are reported. The tritium concentration is 8.5 TU at the surface, and it drops markedly between 600 and 100 m depth to below 1 TU. Tritium concentrations significantly exceed zero down to about 200 m depth. The tritium profile reflects the hydrographic structure at the station. Local vertical mixing can be excluded as the source of the tritium found below 1000 m depth. (Knapp-USGS)
W72-14221

BARIUM AT GEOSECS III IN THE SOUTHWEST PACIFIC,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 02K.
W72-14223

STRONTIUM DISTRIBUTION IN SEA WATER PROFILES FROM THE GEOSECS I (PACIFIC) AND GEOSECS II (ATLANTIC) TEST STATIONS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
G. W. Brass, and K. K. Turekian.
Earth and Planetary Science Letters, Vol 16, No 1, p 117-121, September 1972. 1 fig, 2 tab, 3 ref.

Descriptors: *Strontium, *Trace elements, *Sea water, *Pacific Ocean, *Atlantic Ocean, Spectrophotometry, Mass spectrometry, Salinity, Water chemistry, Analytical techniques, Water analysis, Sampling, Oceanography, Distribution patterns.
Identifiers: *Mass spectrometric isotope dilution analysis.

Strontium was determined at Geosecs I and II test station profiles in the Pacific and Atlantic, respectively, by mass spectrometric isotope dilution (MSID) analysis and atomic adsorption spectrophotometry. The Geosecs I profile shows a range in salinity from 218 to 223 micrograms/gram by MSID; Long Island Sound water yields a value of 2.4. A maximum was found at Geosecs I at a depth of about 500 meters by the atomic adsorption data. Comparison of atomic adsorption data for the Atlantic and Pacific test stations by MSID indicates that the deep Atlantic is about 1.5% lower in Sr/salinity than the deep Pacific. The differences are about as large as the coefficient of variation. (Knapp-USGS)
W72-14224

STUDY OF PH AND EH CHANGES OF WATER-LOGGED SOIL AND IN PURE SYSTEMS,
National Commission on Agriculture, New Delhi (India).
For primary bibliographic entry see Field 02G.
W72-14269

POTOMAC RIVER WATER QUALITY NETWORK: COMPILATION OF DATA.
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 05A.
W72-14281

CONFERENCE IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES--INDIANA-MICHIGAN-NEW YORK-OHIO-PENNSYLVANIA: VOLUMES 1 AND 2.
Federal Water Quality Administration, Washington, D.C.

Held in Detroit, Michigan, June 3 and 4 1970, 740 p. 21 fig, 25 tab, 18 append.

Descriptors: *Water pollution, *Lake Erie, *Mercury, *Municipal wastes, *Industrial wastes, Water pollution control, Water pollution sources, Tributaries, Freshwater fish, Yellow perch, Sewage effluents, Oil spills, Thermal pollution, Nutrients, Bioassay, *Water quality, Algae, Pesticides, Heavy metals, Wastewater treatment, Smelts, Michigan, Ohio, New York, Pennsylvania, Toxicity, Discharge (Water), Phenols, Electric powerplants, Nuclear wastes, Phosphorus, Dissolved oxygen, Cladophora, Acids, Organic wastes, Biochemical oxygen demand, Salmon, Carp, White bass, Channel catfish, Suckers, Bullheads, Buffalo fish, Pike, Sulfate, Chloride, Sodium, Potassium, Calcium, Drums, Sauger, Walleye, Water quality standards, Water analysis.
Identifiers: Maumee River, St. Clair River, Lake St. Clair, Detroit River, Black River, Pine River, Clinton River, Huron River, Bell River, Salt River, Microcystis, Aphanizomenon, Cyanides, Coho salmon, Sheepshead, Chubs, Northern pike, Gizzard shad.

A verbatim transcript of the proceedings of a conference concerned with the water pollution problems of Lake Erie and its tributaries and summaries of the various reports presented have been compiled into a two-volume report. Statements of compliance with the Lake Erie Enforcement Conference Abatement Schedules for municipalities and industries and detailed discussions on the sources of pollution on the lakes, including industrial wastes from major cities such as Detroit and Cleveland, and mercury standards, sources, and levels are also included. Participants in the conference were from water pollution control agencies of the states of Michigan, Indiana, Ohio, Pennsylvania and New York, and of the U. S. Department of the Interior. (Mortland-Battelle)
W72-14282

LYSIMETER STUDIES ON THE SHORT TERM EFFECT OF COMPOSITION OF IRRIGATION WATER ON THE BORON ACCUMULATION IN SOIL,
Udaipur Univ. (India). Coll. of Agriculture.
B. L. Jain, and S. N. Saxena.
J Indian Soc Soil Sci. 19 (2): 171-174. 1971.
Identifiers: *Boron, *Irrigation water, *Lysimeter studies, *Soils.

Boron concentration (B) in available form and water soluble form (saturation extract) increased in the profile up to 150 cm depth. Maximum accumulation of the available form of B occurred at the depth 30-60 cm and in water soluble form at the depth 0-30 cm. Accumulation of B in soil profile increased with the increase in concentration of B in irrigation water. Increase in Na absorption ratio of irrigation water decreased the accumulation of available B and increased the water soluble B. Application of irrigation water having B concentration up to 1.0 ppm did not lead to accumulation of B to toxic concentrations in the short duration of 3 mo.--Copyright 1972, Biological Abstracts, Inc.
W72-14283

MICROBIAL UPTAKE OF LEAD,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-14291

EVIDENCE FOR THE RECOVERY OF THE WATERS OFF THE EAST COAST OF NOVA SCOTIA FROM THE EFFECTS OF A MAJOR OIL SPILL,
Bedord Inst., Dartmouth (Nova Scotia). Atlantic Oceanography Lab.
For primary bibliographic entry see Field 05C.
W72-14292

REDUCTION OF THE 20-CARBONYL GROUP OF C-21 STEROIDS BY SPORES OF FUSARIUM SOLANI AND OTHER MICROORGANISMS. I. SIDE-CHAIN DEGRADATION, EPOXIDE CLEAVAGE, AND SUBSTRATE SPECIFICITY,
Montreal Univ. (Quebec). Faculte de Pharmacie.
For primary bibliographic entry see Field 05C.
W72-14300

HEAVY METALS POLLUTE NATURE, MAY REDUCE PRODUCTIVITY,
Lund Univ. (Sweden). Dept. of Ecological Botany.
For primary bibliographic entry see Field 05C.
W72-14303

IDENTIFICATION OF N,O-DIMETHYHYDROXYLAMINE AS A MICROBIAL DEGRADATION PRODUCT OF THE HERBICIDE, LINURON,
Technische Hochschule, Munich (West Germany); and Bayerische Landesanstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschutz, Munich (West Germany).
For primary bibliographic entry see Field 05A.
W72-14304

RELATIONSHIPS OF CHLOROPHYLL MAXIMA TO DENSITY STRUCTURE IN THE ATLANTIC OCEAN AND GULF OF MEXICO,
Victoria Univ. (British Columbia).
For primary bibliographic entry see Field 05C.
W72-14313

ON THE DEPOSITION AND DISSOLUTION OF ZINC IN ALKALINE SOLUTIONS,
Pennsylvania Univ., Philadelphia. Electrochemistry Lab.
J. O'M. Bockris, Z. Nagy, and A. Damjanovic.
Journal of the Electrochemical Society, Vol 119, No 3, p 285-295, March 1972. 14 fig, 7 tab, 69 ref.

Descriptors: *Zinc, *Alkaline water, *Electrolysis, Ions, Chemical interference, Ion exchange, Aqueous solutions, Electrochemistry, Cathodes, Anodes, Electrolytes, Physiochemical properties, Methodology, Instrumentation, Electrical properties, Thiems equation, Equilibrium.
Identifiers: *Electrodeposition, Ion selective electrodes, Zinc electrodes, Potentiostat, Galvanostat.

The zinc/KOH-zincate electrode reaction was investigated at room temperature under high purity conditions with galvanostatic and potentiostatic transient techniques in the 0.1-3.0 M KOH and 0.0001-0.5 M zincate concentration range. The exchange current density was found to be between 8 and 370 mA/sq cm, with 40 mV/decade anodic and 120 mV/decade cathodic nominal Tafel slopes; an overpotential range of plus or minus 100 mV was covered. The cathodic reaction orders were 1 for zincate, and minus one for hydroxyl ions. A four-step mechanism, consistent with the kinetic data, is suggested. It consists of four consecutive dissociation reactions of the zincate complex, with two of them incorporating a single electron charge transfer. The mechanism of the anodic and cathodic reactions is the same. The transients indicate only double layer charging and charge transfer processes. No surface diffusion effects or intermediate build-up was observed (no pseudocapacitance). A rationalization is given for the mechanism. The effect of zinc surface preparation is discussed. (Snyder-Battelle)
W72-14322

DISTRIBUTION OF CLOSTRIDIUM BOTULINUM TYPE E IN THE GULF OF ST. LAWRENCE IN RELATION TO THE PHYSICAL ENVIRONMENT,
Fisheries Research Board of Canada, Halifax (nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 05C.
W72-14325

HETEROTROPHIC NITRIFICATION BY ARTHROBACTER SP.,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 05C.
W72-14328

EFFECT OF AMINO ACIDS ON THE GROWTH OF ACETOBACTER SUBOXYDANS,
The Pennsylvania State Univ., University Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-14329

THE ASSIMILATION OF MONOCARBON COMPOUNDS BY PSEUDOMONAS SP. 2,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05C.
W72-14335

BENTHIC FAUNAL RECOVERY IN A SWEDISH FJORD FOLLOWING THE CLOSURE OF A SULPHITE PULP MILL,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
For primary bibliographic entry see Field 05C.
W72-14337

THE ECOLOGY OF MORECAMBE BAY. II. INTERTIDAL INVERTEBRATES AND FACTORS AFFECTING THEIR DISTRIBUTION,
Nature Conservancy, Norwich (England). Coastal Ecology Research Station.
For primary bibliographic entry see Field 05C.
W72-14338

THE ECOLOGY OF MORECAMBE BAY. IV. INVERTEBRATE DRIFT INTO AND FROM THE RIVER LEVEN,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W72-14339

WATER SUPPLY AND WASTE DISPOSAL SERIES: VOLUME I. TERMINOLOGY STANDARDIZATION AND MICROBIOLOGY.
Federal Highway Administration, Washington, DC, Office of Research; and Federal Highway Administration, Washington, D.C. Office of Development.

Dept of Transportation-Federal Highway Administration Staff Report 72R-106S-1, November 1971. 51 p, 16 fig, 12 tab, 141 ref. append.

Descriptors: *Water supply, *Waste disposal, *Recreation wastes, *Microorganisms, *Water pollution sources, Reviews, Microbial degradation, Classification, Sewage, Soil properties, Groundwater movement, Outfall servers, Streams, Septic tanks, Fungi, Algae, Water pollution control.
Identifiers: *Roadside rest areas.

This is the first volume of a series of reports on water supply and waste disposal published by the Federal Highway Administration. This series emphasizes water supplies, water-carriage waste treatment, and solid waste disposal, particularly as they relate to roadside rest areas. Because definitions, classifications, and terminology concerning microorganisms and biological terms sometimes lack uniformity among the disciplines, this volume defines and standardizes the terminology that will be used in all volumes of the series. Information on diseases that might be transmitted at rest or recreation areas is presented. The capability of individual species of microorganisms to survive in the soil, on the soil, in water, and in other situations is indicated. A bibliography containing 14 references is included. (Woodard-USGS)
W72-14363

MAN-MADE ENVIRONMENT AS VIEWED FROM SPACE: WATER AND AIR POLLUTION,
Leningrad State Univ. (USSR).
B. V. Vinogradov.
Available from NTIS, Springfield, Va. 22151, as N72-12322, Price $3.00 paper copy; 95 cents microfiche. National Aeronautics and Space Administration Technical Translation Report (NASA TT F-14079), November 1971. 16 p, 4 fig, 20 ref. (Paper presented at 22nd International Astronautical Federation Congress, Brussels, Sept 1971).

Descriptors: *Water pollution sources, *Remote sensing, *Aerial photography, *Satellites (Artificial), *Pollutant identification, Air pollution, Reviews, Data collections, International commissions, Water pollution control, Planning.
Identifiers: Spacecraft.

A study of water pollution using space methods (aerial spectrometry and photography) is in the stage of aircraft and theoretical modeling. The water pollution in the inland and oceanic waters is detected by different remote indicators; (1) tone and color changes influenced by transportation of suspended, washed out, and sewage materials; (2) thermal anomalies due to admixture of the exhaust waters; (3) foam formed in mixing the warm chemical and cold natural waters; (4) changes in water vegetation under influence of thermal and chemical properties; (5) rising of exhaust matter to water surface; (6) affect of active films on surface waves and scattering functions of sea surface; and (7) affect of oil and other active films on the color and spectral reflectivity of sea surface. Also, atmospheric pollution must be inspected worldwide because of its international character. (Woodard-USGS)
W72-14373

SANITARY WASTE WATER TREATMENT AND DISPOSAL AS RELATED TO DEVELOPMENT--LAKE COUNTY, FLORIDA.
Florida Dept. of Community Affairs, Tallahassee. Technical Assistance Div.
For primary bibliographic entry see Field 05D.
W72-14383

VERMONT WATER QUALITY SIMULATION PROJECT REPORT,
Thayer School of Engineering, Hanover, N.H.
A. O. Converse, and J. Tyler.
Prepared for: Vermont Natural Resources Council, Montpelier, (Project EPIC), February 1972. 66 p, append.

Descriptors: *Vermont, *Data processing, *Simulation, *Water quality control, *Watersheds (Basins), *Waste water (Pollution), *Water analysis, *Planning, *Computer models, New England, Runoff, Low flow, Flow rates, Gaging stations, Biochemical oxygen demand, Dissolved oxygen.
Identifiers: *Winooski Watershed, *Waste discharge, *Winooski River.

A water quality simulation program as applied to the Winooski Watershed in Vermont is presented, examining the economic feasibility of using computer data storage and processing as a planning tool in the control of waste water pollution. Sources of waste discharge are located and numbered beginning with the headwater of a branch and numbering sequentially down each branch. Runoff per unit land area during low flow conditions is computed from the 10-year, 7-day low flow at the nearest gaging station and corresponding land area drained. A water quality simulation plot of the main branch of the Watershed is included, showing clearly the effect of discharge of the stone works and organic wastes in the Montpelier-Barre area. The program and data are stored in Dartmouth's time-shared computing system and are available to anyone with telephone and teletype. Results show computer costs are reasonable. Since discharge data must be acquired and planning studies must be made anyway, most probably an available computer data storage and processing capability would reduce manpower requirements. Given the nature of watersheds in New England, a central time-shared facility would seem quite desirable. (Bell-Cornell)
W72-14392

THERMAL DISCHARGE: A MODEL-PROTOTYPE COMPARISON,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
P. D. Hindley, R. M. Miner, and R. F. Cayot.
Journal of the Power Division, Proceedings of ASCE, Vol 97, No PO4, Proc. Paper 8580, p 783-798, December 1971. 11 fig, 2 ref.

Descriptors: *Thermal pollution, *Model studies, *Remote sensing, Estuaries, Cooling water, Temperature, Water, Mixing, Dispersion, Powerplants, Tidal waters, Isotherms, *Thermal powerplants, Heated water.
Identifiers: Model-prototype study, *San Francisco Bay System, *Infrared temperature detection.

Infrared temperature sensing systems were used to compare the temperature fields resulting from a prototype power plant's condenser cooling water discharge with those obtained by simulating the discharge on a distorted hydraulic model. IR temperature measurement offers certain advantages over the more common thermocouple or thermistor temperature sensing and recording systems. The prototype plant is located in the upper reaches of San Francisco Bay, and was simulated on the San Francisco Bay-Delta model. The model is operated by the Corps of Engineers and has 1000:1 horizontal and 100:1 vertical length ratios. Photographic images of the temperature fields on both model and prototype are presented, along with best fit lines relating nondimensional surface temperature increase and the surface area enclosed by the increase. The general features of the prototype fields were satisfactorily reproduced by the model. The IR systems used are described. The prototype mixing process would be expected to be more random than that with the model since there are more variables with the prototype than with the model. (Oleszkiewicz-Vanderbilt)
W72-14393

SOME ENVIRONMENTAL FACTORS TO BE CONSIDERED IN THE DESIGN OF THERMAL POWER PLANTS IN THE NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 05G.
W72-14394

COMPUTER MODEL FOR A THERMAL PLUME,
Detroit Edison Co., Mich.
R. E. Barry, and D. P. Hoffman.
Journal of the Power Division, Proceedings of ASCE, Vol. 98, No. P01, p 117-132, June 1972. 7 fig, 2 tab, 3 ref.

Descriptors: *Computer models, *Heated water, *Velocity, *Temperature, Turbulent flow, Shallow water, Cooling water, Discharge measurement, Thermal powerplants, Jets, Model studies, Thermal pollution.
Identifiers: *Thermal plumes, Mixing zone, Eddy diffusivity.

A digital computer program is described for determination of the temperature and velocity profiles in a shallow body of water resulting from the discharge of condenser cooling water from a powerplant. The purpose of this computer model is to start with the applicable equations for mass, momentum and energy transfer, include the effects of the lake bottom, the lake current, and the wind velocity, and to produce a scheme whereby existing data on thermal plumes may be extrapolated to other conditions. The assumptions made in the derivation of the equations imply the absence of waves and more importantly, neglect the contributions of the buoyant forces which may become dominant as the plume velocity decreases to that of the local current. Two mixing coefficients for the horizontal and vertical eddy diffusion of momentum require field data for verification. (Upadhyaya-Vanderbilt)
W72-14407

HEATED-EFFLUENT DISPERSION IN LARGE LAKES: STATE-OF-THE-ART OF ANALYTI-

CAL MODELING. PART 1. CRITIQUE OF MODEL FORMULATIONS,
Agronne National Lab., Ill. Center for Environmental Studies.
A. J. Policastro, and J. V. Tokar.
Publication No. ANL/ES-11, Waste Heat Disposal, January 1971. 373 p, 151 fig, 17 tab, 25 ref, append.

Descriptors: *Heated water, *Heat transfer, *Mathematical models, *Jets, *Outlets, Buoyancy, Heat budget, Currents (Water), Discharge (Water), Winds, Wind pressure, Computer models, Computer programs, Dispersion, Lakes, Diffusion, Model studies, *Reviews.
Identifiers: *Waste heat disposal, Critical review, *Outfall modeling, Near-field issues, Far-field issues, Jet regime, Buoyant jets, Heated jet, Lake Monona, Great Lakes, Cayuga Lake model, Entrainment coefficient, Drag coefficient, Motz-Benedict model, Stolzenbach model, Harleman, Edinger-Polk model, Heat losses, Wind stress, Jet diffuser.

This is part of a three-part literature survey to delineate the state-of-the-art of available methods for predicting heated-effluent dispersion from powerplant condenser-cooling-water discharges into large lakes. This report, which will be periodically updated, concentrates solely on mathematical predictive methods. Two companion reports assess the state-of-the-art of hydraulic modeling which could possibly be used to validate predictive methods. Essentially 16 mathematical models have been critically reviewed concerning their formational development. Criticisms have been made discussing individual model treatment of geometric, kinematic, hydrodynamic, and thermodynamic variables. The models have been categorized according to their regime of applicability, and contrasting and congruous qualities between models within each category have been summarily presented. (Oleszkiewicz-Vanderbilt)
W72-14409

THERMAL-HYDRAULIC STUDY: ARKANSAS COOLING RESERVOIR,
Bechtel Corp., San Francisco, Calif.
H. S. Riesbol, J. B. Anderson, F. H. Wend, and H. T. Holmes.
Journal of the Power Division, Proceedings of ASCE, Vol. 97, No. P01, Proc. Paper 7811, p 93-113, January 1971. 17 fig, 9 ref.

Descriptors: *Cooling, *Model studies, *Temperature, *Powerplants, Thermodynamics, Reservoir operation, Heat transfer, Heated water, *Arkansas, Flow profiles, Jets, Environmental engineering, Water, Water quality, Thermal powerplants, Entrainment, *Thermal pollution.
Identifiers: *Thermal-hydraulic model, *Heat dissipation, *Arkansas Reservoir, Heat exchange coefficient, Isotherms.

An 850-Mw nuclear power plant to be built by Arkansas Power and Light Company on the Dardanelle Reservoir on the Arkansas River will utilize reservoir water for condenser cooling. Analysis of expected thermal effects due to the cooling water discharge was required to establish that water quality criteria will be met. A review of reservoir heat dissipation principles is presented. An analytical solution with a heat balance based on flow patterns developed by jet momentum-entrainment theory is described. A thermal-hydraulic laboratory study using a large distorted scale model with controlled atmospheric conditions was undertaken to corroborate the analytical results. Water temperatures were recorded on a three-dimensional pattern utilizing over 300 thermocouples and an automatic digital recorder. Flow patterns were observed and recorded. Model operation, and analysis and interpretation of data are given. Based on the results of the analytical and thermal-hydraulic model investigations, it was shown that the plant heat load of 137.5 x 10 to the 9th power Btu per day can be dissipated in Dardanelle Reservoir under the prescribed criteria and limitations. The thermal hydraulic model is a useful tool for the solution of complicated thermal power plant heat dissipation problems. (Oleszkiewicz-Vanderbilt)
W72-14414

VELOCITY AND TEMPERATURE IN BUOYANT SURFACE JET,
Tahal Consulting Engineers Ltd., Tel Aviv (Israel).
R. Dornhelm, M. Nouel, and R. L. Wiegel.
Journal of the Power Division, Proceedings of ASCE, Vol. 98, No. P01, p 29-47, June 1972. 15 fig, 3 tab, 21 ref.

Descriptors: *Jets, *Mixing, *Velocity, *Temperature, *Turbulence, Surface tension, Cooling water, Froude number, Eddies, Density, Saline water, Laboratory tests, *Thermal pollution.
Identifiers: Buoyant jets, Hot film anemometers.

Laboratory studies of turbulence in surface buoyant jets were made using hot film anemometers. Results showed considerable turbulence was generated in the jets. Comparisons are presented for temperature and velocity fluctuations in surface jets for a range of Reynolds numbers and densimetric Froude numbers. Difficulties in using hot film anemometers in salt water are described, together with methods to minimize some of the difficulties. Large scale surface eddies resulting from the interaction of the sidewalls of the tank with the surface spreading jet tended to confine the jet to a narrow stream along the center line. Experimental results showed that surface tension was not a significant variable in the jet mixing. (Eagle-Vanderbilt)
W72-14416

DDT IN WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-212 262, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center, Report WRSIC 71-211, October 1971. 278 p.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Bibliographies, *Abstracts, Information retrieval, Water pollution sources, Path of pollutants, Pollutant identification.

This bibliography contains 196 abstracts with full bibliographic details for selected reports, journal articles, and various documents published mostly since 1967. Produced from a computerized information base containing 32,719 abstracts at the time of search, the bibliography is representative of the information on DDT in water contained in the journal 'Selected Water Resources Abstracts' through October 15, 1971 (Volume 4, Number 20). A significant descriptor index is given of representative weighted terms that best describe the information content of the abstracted items. A comprehensive index is also given that represents all descriptors and identifiers used to index the various papers and documents represented by the abstracts in the bibliography. Abstract items are arranged in ascending WRSIC Accession Number sequence.
W72-14431

POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO,
New Mexico State Univ., University Park. Water Resources Research Inst.
P. D. Bigbee, and R. G. Taylor.
Available from the National Technical Information Service as PB-212 264, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report 005, Partial Completion Report, August 1972. 30 p, 8 fig, 15 ref.

Descriptors: *Coliforms, Water pollution sources, Recharge, *New Mexico, Seasonal, *Bacteria, Groundwater, Aquifer characteristics.
Identifiers: *Ogallala aquifer, *Portales (N Mex), Coliform organisms, Fecal pollution.

Preliminary examination of the aquifer in the vicinity of Portales, New Mexico, indicated the presence of coliform bacteria within a two mile radius of the town of Portales. Coliform organisms are used as bacterial indicators of fecal pollution. The presence of these bacterial organisms in the water table at Portales is indicative of recharge to the aquifer. This study will examine both chemical and bacterial parameters of the aquifer and extend the results to eluciwhich little or no nitrogenous fertilizers were used demonstrated low aquifer nitrate concentrations regardless of water usage. (See also W72-14434 and W72-14436) (Creel-New Mexico State)
W72-14434

FLUCTUATIONS IN NITRATE CONCENTRATIONS UTILIZED AS AN ASSESSMENT OF AGRICULTURAL CONTAMINATION TO AN AQUIFER OF A SEMIARID CLIMATIC REGION,
New Mexico State Univ., University Park. Water Resources Research Inst.
R. G. Taylor, and P. D. Bigbee.
Available from the National Technical Information Service as PB-212 265, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report 006, Partial Completion Report, August 1972. 12 p, 1 fig, 4 tab, 9 ref. OWRR A-034-NMEX (3).

Descriptors: Water pollution sources, Aquifer characteristics, *New Mexico, Irrigation, *Fertilizers, Nitrates, Arid lands.
Identifiers: *Nitrate contamination, *Agricultural contamination, Semiarid climatic region.

Aquifer water has become contaminated in regions that have been developed for agriculture. Nitrate contamination has been shown to be permeable to the aquifer and harmful to human health. An assessment of agricultural practices and their roles in contamination of aquifers has been undertaken with difficulty in the past. Nitrate concentrations have been utilized in this study to demonstrate their applicability to examining agriculture practices which contaminate aquifer water. Areas treated with nitrogenous fertilizers and subsequently irrigated were found to contain aquifer fluctuations in nitrate content directly in proportion to irrigation seasons. Agricultural industries with high animal densities per land area, and high water consumption for maintenance, were found to have high, but non-fluctuating, nitrate concentrations. Areas with high animal density per land area with low water usage for maintenance; areas with low animal density per land area; and agricultural practices for which little or not nitrogenous fertilizers were used demonstrated low aquifer nitrate concentrations regardless of water usage. (See also W72-14434 and W72-14436) (Creel-New Mexico)
W72-14435

UNDERGROUND WASTE MANAGEMENT AND ENVIRONMENTAL IMPLICATIONS - A SYMPOSIUM.
American Association of Petroleum Geologists, Inc., Midland, Tex.
For primary bibliographic entry see Field 05G.
W72-14480

WELL CONSTRUCTION AND WATER QUALITY,
Department of Agriculture, Beltsville, Md.
E. E. Jones, Jr.
Presented at 1971 Winter Meeting of American Society of Agricultural Engineers, Chicago, Illinois, Paper No. 71-703, 15 p, December, 1971. 2 tab, 15 fig, 3 ref.

Descriptors: *Coliforms, *Ground water recharge, Grouting, Pesticides, Turbidity, *Monitoring, Water quality control, Water pollution sources.
Identifiers: *Sanitary defects, Chlordane.

Wells lacking adequate sanitary protection serve as unauthorized uncontrolled ground water recharge points. Common, easily detected sanitary defects are described. A detailed investigation of a contaminated well, apparently having adequate sanitary protection, was made. Design recommendations are not included. (Campbell-NWWA)
W72-14494

ENVIRONMENTAL FRAMEWORK OF GROUND-WATER CONTAMINATION,
Geological Survey, Washington, D.C.
H. E. LeGrand.
Ground Water, Vol 3, No 2, p 11-15, April, 1965. 5 ref.

Descriptors: *Pollutants, *Groundwater recharge, Encroachment, Saline water intrusion, Saline water - freshwater interfaces, Porosity, Permeability, Recharge wells, Radioactive wastes, Water pollution sources, *Dispersion, *Path of pollutants.
Identifiers: Mineralized water, Sorptive capacity.

The volume of useable ground water is shrinking in many places because of dispersion of contaminated water. Ways of contamination and pertinent parts of the physical environment include: waste-disposal practices (at or near land surface and in deep formations), artificial recharge (at land surface and in aquifers), accidents, and salt-water contamination of aquifers. Evaluation of waste-disposal problems calls for appreciation of two opposing tendencies - the tendency of wastes to move with ground water and the tendency to be attenuated near disposal sites by decay or inherent decrease in potency, by chemical and physical sorption, and by dilution through dispersion of ground water. (Campbell-NWWA)
W72-14502

BACTERIOLOGICAL AND CHEMICAL FACTORS IN INDUCED INFILTRATION,
For primary bibliographic entry see Field 05G.
W72-14504

HYDROGEOLOGIC FACTORS IN PROBLEMS OF CONTAMINATION IN ARID LANDS,
Nevada Univ., Las Vegas. Desert Research Inst.
G. B. Maxey, and R. N. Farvolden.
Ground Water, Vol 3, No 4, p 29-32, October, 1965. 3 fig, 4 ref.

Descriptors: *Nevada, *Arid lands, Basins, *Waste water disposal, Hydraulic gradient, *Groundwater recharge, Alluvial aquifers, Great Basin.
Identifiers: *Discharge areas, *Hydrologic analysis, Carbonate aquifers.

The ideal hydrologic system in arid lands includes a recharge area in mountains and a discharge area in lowlands, a system modified in nature by geologic and physiographic factors. Population and agricultural activity concentrates in valleys, usually in zones of ground-water discharge. Most water-supply, contamination and disposal problems arise from this combination of features. The suitability of hydrogeologic units for any function of operations involving water supply or waste disposal depends primarily on their position within the hydrologic system and secondarily on physical properties. For example, at the Nevada Test Site the ground-water flow system is used to good advantage, whereas at Las Vegas, 70 miles away, the methods of disposal practiced are in direct conflict with the system. (Campbell-NWWA)
W72-14508

A WATER QUALITY MANAGEMENT STRATEGY FOR THE GREAT LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.
W72-14544

DDT AND PCB IN FISH,
For primary bibliographic entry see Field 05C.
W72-14583

PROCEDURE AND RESULTS OF GROUNDWATER POLLUTION STUDIES IN TEHERAN AREA, IRAN,
Ministry of Water and Power, Teheran (Iran). Research Div.
F. Esfandiari.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 3-7, 1972. 3 tab, 4 ref.

Descriptors: Water pollution sources, *Path of pollutants, *Waste disposal wells, *Artificial recharge, Sewage disposal, Bacteria, Nitrates, Hydrogeology, Water supply, Groundwater movement, Groundwater, Malencleves.
Identifiers: *Iran, *Groundwater pollution.

Research on groundwater pollution has been carried out in the Teheran Region, Iran, since 1968. The project area covers 1,064 sq. km. Water samples were taken from about 210 wells and subjected to chemical and bacteriological analysis. The chemical quality of the groundwater in the area is generally good and the water quality zones are well defined. Despite recharge to the aquifer by untreated sewage in the city area, the mass of water in the aquifer is not significantly polluted. There is, however, bacteriological evidence of slight contamination by filtered sewage recharge. The water is suitable for public supply after treatment under close control by super-chlorination and dechlorination only, no filtration being needed. (Knapp-USGS)
W72-14590

WATER QUALITY PROBLEM IN EASTERN OSAKA, JAPAN,
Osaka City Univ. (Japan).
For primary bibliographic entry see Field 02F.
W72-14606

DISPERSION OF GROUNDWATER FLOW,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 02F.
W72-14608

THE FRAUNHOFER LINE DISCRIMINATOR: AN AIRBORNE FLUOROMETER,
Geological Survey, Washington, D.C.
G. E. Stoertz.
Available from NTIS, Springfield, Va 22151 as N72-18448 (NASA-CR-125643)-Price $3.00 paper copy; $0.95 microfiche. Geological Survey-National Aeronautics and Space Administration Interagency Report NASA-157, 1969. 30 p, 6 fig, 2 tab, 20 ref.

Descriptors: Water pollution sources, *Remote sensing, *Tracking techniques, *Instrumentation, Fluorescence, Analytical techniques, *Path of pollutants, Solar radiation, Reflectance, Analog computers.
Identifiers: Photomultiplier.

Applications of the Fraunhofer Line Discriminator (FLD) include remote sensing of fluorescent dyes used in studies of current dynamics. The basic technique is applicable to detection of oil spills, monitoring of pollutants, and sensing over land areas. The FLD can differentiate and measure solar-stimulated luminescence when viewed against a background of reflected light. Key elements are two extremely sensitive photomultipliers, two glass-spaced Fabry-Perot filters having a bandwidth less than 1 angstrom, and an analog computer. As in conventional fluorometers, concentration of a fluorescent substance is measured by comparison with standards. Quantitative use is probably accurate only at low altitudes but detection of luminescent substances should be possible from any altitude. (Woodard-USGS)
W72-14613

MERCURY STIRS MORE POLLUTION CONCERN.

Chemical and Engineering News, June 22, 1970. 2 p, 1 fig.

Descriptors: *Mercury, *Great Lakes Region, *Fish, *Industrial wastes, Freshwater fish, Water pollution, Water pollution effects, Bottom sediments, Dredging, Toxicity.
Identifiers: *Mercury discharges, *Industrial sources, Chlor-alkali plants, Electrical apparatus, Mercury consumption, Mercury levels, Fish tissue contents, Toxicity levels, FDA standards.

Due to the recent (1969/1970) bans on fishing, caused by finding mercury in the fish tissue and industrial discharges to the Great Lakes watershed, the United States and Canadian businesses are claiming losses of more than one billion dollars in commercial and sport fishing. A mercury concentration and accumulation pattern is indicated. Two aspects of the problem are mentioned. The problem of mercury loss (over 6 million pounds in 1969) from industries such as mercury cell chlor-alkali plants can be solved. Another concern is what to do with the mercury already lying on the river or lake bottoms. Dredging could release more mercury over a larger area and could in effect be detrimental. Mercury has not escaped into water in sufficient quantities to endanger drinking water supplies to the cities in the Lake Erie watershed. The only measurable concentration found in water was in Detroit River and was 0.05 mg/l. (Oleszkiewicz-Vanderbilt)
W72-14619

TOXIC EFFECTS OF CADMIUM: A REVIEW,
Food and Drug Administration, Rockville, Md. Bureau of Drugs.
For primary bibliographic entry see Field 05C.
W72-14621

PRELIMINARY STUDY OF MERCURY RESIDUES IN SOILS WHERE MERCURY SEED TREATMENTS HAVE BEEN USED,
Agricultural Research Service. Hyattsville, Md.
P. F. Sand, G. B. Wiersma, H. Tai, and L. J. Stevens.
Pesticides Monitoring Journal, Vol 5, No 1, p 32-33, June 1971. 1 tab, 3 ref.

Descriptors: *Mercury, *Soil contamination, *Soil management, *Seed treatment, *Agricultural chemicals, Neutron activation analysis, Statistical methods, Great Plains.
Identifiers: *Mercury residues, *Mercury treated seed, *Soil samples, Soil monitoring program.

Ninety-three soil samples collected in 1968 from the small-grain producing areas of the North Central United States were analyzed for mercury residues by neutron activation analysis. Half the samples were from areas where mercury-treated seed had been used in 1968 and the other half were from areas of no use. Mercury was found in almost all soil samples. A significant difference was found in mean levels between areas of use and no use, with the higher residues occurring in areas where mercury had not been used in 1968. The significance of the results is considered questionable because there is no record of whether or not mercury was used prior to 1968 and there was considerable variation resulting from analytical techniques. There is a need for more extensive soil sampling for mercury residues. (Oleszkiewicz-Vanderbilt)
W72-14623

TRACE METAL CHARACTERIZATION BY ANODIC STRIPPING VOLTAMMETRY,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 05A.
W72-14626

A METHOD FOR ENVIRONMENTAL MERCURY POLLUTION CONTROL IN DEVELOPING AREAS,
Aarhus Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 05A.
W72-14627

THE TRANSITIONAL CONDITION OF MINAMATA BAY AND THE NEIGHBORING SEA POLLUTED BY FACTORY WASTE WATER CONTAINING MERCURY,
Kumamoto Univ. (Japan). Dept. of Hygiene; and Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W72-14628

FISH AND MERCURY.
For primary bibliographic entry see Field 05C.
W72-14633

ROTATING RING-DISK STUDY OF THE REDUCTION OF OXIDIZED PLATINUM BY MERCUROUS MERCURY AND ITS ADSORPTION ON REDUCED PLATINUM,
State Univ. of New York, Buffalo. Dept. of Chemistry.
S. Bruckenstein, and M. Z. Hassan.
Analytical Chemistry, Vol 43, No 7, p 928-932, June 1971. 5 fig, 12 ref. AFSOR 70-1832.

Descriptors: *Electrodes, *Adsorption, *Mercury, Reduction, Oxidation, Graphical analysis.
Identifiers: *Platinum disk electrode, Current-potential curve, Rotator.

A potential-time study at a rotating platinum disk electrode showed that Hg (I) in 1.04M HC104, reduces an oxidized platinum surface. Using a rotating platinum ring-disk electrode, the time-dependent ring collection curves demonstrated that the amount of Hg (II) produced was less than the amount of Hg (I) consumed during the reduction of the oxidized platinum surface. The quantity of Hg (II) produced agreed with the electrical charge required to reduce the oxidized platinum surface. The difference between the amount of Hg (I) consumed and Hg (II) produced (357 plus or minus 47) microC/sq cm corresponds to the amount of Hg (I) adsorbed on a reduced Pt surface. The quantity of adsorbed Hg (I) was independently established by determining the charge (1) required for reduction to Hg (O) on the disk; (2) required for oxidation to Hg (II) on the disk before and after reducing the disk; and (3) corresponding to the amount of Hg (II) produced in (2) using the ring electrode. (Upadhyaya-Vanderbilt)
W72-14634

CHEMICAL METHYLATION OF INORGANIC MERCURY WITH METHYLCOBALAMIN, A VITAMIN B12 ANALOG,
Tokyo Univ. (Japan). Faculty of Pharmaceutical Sciences.
N. Imura, E. Sukegawa, S-K. Pan, K. Nagao, and J-Y. Kim.
Science, Vol 172, p 1248-1249, June 11, 1971. 1 fig, 1 tab, 9 ref.

Descriptors: *Mercury, *Chemical reactions, Water pollution sources, Chromatography, Analytical techniques, Kinetics, Laboratory tests, Reduction, Sediments.
Identifiers: *Methylation, Methylcobalamin, Methylmercury.

The kinetics of chemical transmethylation from methylcobalamin (a known methyl donor in biological systems) to inorganic mercury under various conditions are reported. The transmethylation proceeded at an unexpectedly high rate after the methylcobalamin was mixed with inorganic mercury in neutral aqueous solution in the absence of reducing agents. Silica gel thin-layer chromatography with the use of three solvent systems revealed that the reaction products dimethylmercury and methyl mercuric chloride, were formed in different ratios, depending on the molar ratio of the reactants and the reaction times. The results indicate that mercuric chloride was essential for the liberation of the methyl group from methylcobalamin. Methylcobalamin is isolable not only from microorganisms but also from mammalian sources such as calf liver and human blood plasma. It is therefore believed to be widely distributed in nature. (Upadhyaya-Vanderbilt)
W72-14635

A WATER QUALITY MODEL FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
California State Water Resources Control Board, Sacramento.
G. S. Nicolson.
(1972), 36 p, 5 fig, 13 tab, 33 equa.

Descriptors: *North Carolina, *Natural streams, *Dissolved oxygen, Evaluation, Water quality, Organic wastes, Organic loading, Biochemical oxygen demand, River basins, Runoff, Hydraulics, Evaluation, Mathematical models, Systems analysis, Streamflow.
Identifiers: *Piedmont, *Haw River, *Cape Fear River basin, *Yadkin River basin, *Waste assimilative capacity, *Linear functions, *Sensitivity analysis, *Streeter-Phelps equation, River stretches, Dilution water, Buffalo Creek, Reedy Fork.

A water quality model is used to evaluate dissolved oxygen levels in natural streams. DO is chosen as water quality parameter because of its vital contribution to the balance of stream life and because of its response to organic pollution. The model is formulated so that the deficits at the end of river stretches are linear functions of upstream loading conditions. Given the loading conditions and the transfer coefficients, which relate the loading to downstream deficits, the dissolved oxygen profile and the waste assimilative capacity of the stream can be determined. Dealt with first are the derivation of the model, the necessary conditions for use of the model and the sensitivity of the model to changes in the parameters: The Streeter-Phelps equation for relating DO response to organic pollution is the fundamental equation used in the model. Next, a detailed application of the model to the Buffalo Creek--Reedy Fork subregion of the Haw River is presented, listing the data required and giving the resulting dissolved oxygen profiles. Results of the model are confirmed by comparing them to field tests made by the Federal Water Pollution Control Administration and indicate the importance of waste treatment alternatives versus low flow augumentation. (See W72-14638) (Bell-Cornell)
W72-14641

DISPERSION OF POLLUTANTS IN THE COASTAL WATERS OF THE SOUTHEASTERN UNITED STATES,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom.
In: Colloque International sur L'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I, 12 p, 3 fig, 10 ref.

Descriptors: *Southeast US, Coasts, *Littoral, Water pollution control, Industries, Wastes, *Mercury, *Dispersion, Physical control, *Biocontrol, *Chemcontrol, Estuaries, Marshes, *Waste disposal, Environmental effects, South Carolina, Florida, Path of pollutants.

The environmental characteristics of the littoral zone of the southeastern United States are described. Physical, chemical and biological processes all determine the dispersion patterns of pollutants. The physical processes transport the pollutants southward and landward into salt marshes and estuaries. The chemical and biological processes often convert pollutants from one form to another, sometimes resulting in trapping the pollutants in esturaies and marshes. To avoid environmental degradation it is suggested that wastes be discharged at approximately 10 kms offshore. (Ensign-PAI)
W72-14651

CURRENT VELOCITIES IN THE VICINITY OF THE GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT'S IONA ISLAND OUTFALL - 1968,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
S. Tabata, L. F. Giovando, and D. Devlin.

Descriptors: *Outlets, *Outfall sewers, *Canada, Sewage treatment, Treatment facilities, Population, Wastes, *Domestic wastes, Currents (Water), Ocean currents, *Current meters, Velocity, Flow measurement, *Circulation, Tracking techniques, *Tracers, Aerial photography, Effluents, Public health, Waste disposal.
Identifiers: Iona Island, Georgia Straits.

The Greater Vancouver Sewerage and Drainage District maintains a major sewage primary treatment plant on Iona Island. The treated effluent is released to the Strait of Georgia through an open channel running roughly westward, almost to the edge of Sturgeon Bank. The Iona Jetty flanks the channel to the North as a supposed barrier against northward movement of effluent across Sturgeon Bank. The rapidly increasing load on the existing facility with the accompanying medical and esthetic problems prompted an investigation on current velocities to provide information necessary to determine the district's future plans for sewage disposal in the area. Both surface and subsurface circulation were studied in 1968. Current-metering, free floating surface current followers and visual/aerial photographic tracking containing 'tracers' were employed. (Ensign-PAI)
W72-14657

STUDIES ON THE EFFECTS OF A STEAM ELECTRIC GENERATING PLANT ON THE MARINE ENVIRONMENT AT NORTHPORT, NEW YORK,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 05C.
W72-14659

RISKS OF RADIOACTIVE POLLUTION OF THE OCEANS,
California Univ. Medical Center, San Francisco. Radioactivity Research Center.
For primary bibliographic entry see Field 05G.
W72-14661

WATER POLLUTION BY SEWAGE FROM WATER CRAFT,
Washington, Univ., Seattle. Coll. of Engineering.
R. W. Seabloom.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I. 13 p, 4 fig, 10 ref.

Descriptors: *Ships, *Boats, *Sewage disposal, Water pollution treatment, *Bacteria, *Ecology, Water pollution control, Legislation, Technology, Disinfection, Incineration, Washington, California.
Identifiers: Recirculating, flush toilets, Holding tanks, *Meydenbauer Bay, *Wollochet Bay, *San Diego Bay.

The pollution by water craft waste discharges in Meydenbauer Bay, an inlet on Lake Washington, Wollochet Bay, a harbor on Puget Sound and San Diego Bay was investigated. Bacterial counts were taken and the ecology of the areas studied. Pollution control devices macerator-disinfectors, self contained recirculating flush toilets, incinerators, and holding tanks are some of the possibilities considered to aid in abatement of this pollution problem. International legislation and additional research to improve the technology for handling vessel wastes are suggested for improvement of the present minimally adequate systems. (Ensign-PAI)
W72-14663

RESOURCES, ENVIRONMENTAL PROBLEMS AND TECHNOLOGICAL SOLUTIONS IN CHESAPEAKE BAY,
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 05C.
W72-14664

SOME ECOLOGICAL POINTS REGARDING WATER POLLUTION, (EINIGE OKOLOGISCHE GESICHTSPUNKTE BEIM GEWASSERSCHUTZ),
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
W. Stumm.
In: Eidgenossische Technische Hochschule, Eidgenossische Anstalt fur Wasserversorgung, Abwasserreinigung und Gewasserschutz, Dubendorf-Zurich, Schweiz, Separatum Nor. 392, p 15-36, 1971. 8 fig, 2 tab, 13 ref.

Descriptors: Water pollution effects, *Ecology, *Energy, Pollutants, *Ecological effects, *Balance of nature, Life cycles, Selectivity, Succession, Carbon dioxide, Smoke, Oil, Chemicals, Fertilizers, Heavy metals, Pollution abatement.

Pollution of the environment is unquestionably connected with the increasing use of energy reserves as our civilization develops. Smoke, carbon dioxide, oil, petrochemical and other synthetic chemicals together with fertilizers and heavy metals eventually find their way into the environment, disturbing the balance of nature and natural selections by influencing biological counteractions and hydrochemical cycles. Unstable environmental systems produce extreme reactions to outside influences. An understanding of ecological law and counteractions between the world of organisms and an abiotical world are necessary as a basis for control and abatement of pollution. (Brown-PAI)
W72-14669

WATER POLLUTION BY OIL. THE PROBLEM OF PERSISTENT CHEMICALS PRESENT IN THE ENVIRONMENT, (VERUNREINIGUNG DER GEWASSER DURCH OL. ZUM PROBLEM DER PERSISTENTEN CHEMIKALIEN IN DER UMWELT),
Woods Hole Oceanographic Institution, Mass.
M. Blumer.
In: Eidgenossische Technische Hochschulen, Eidgenossische Anstalt fur Wasserversorgung, Abwasserreinigung und Gewasserschutz, Dubendorf - Zurich, Schweiz, Seperatum No. 398, p 1-21, 1971. 21 fig.

Descriptors: *Oil pollution, *Oil spills, *Oil wastes, Ships, *Accidents, *Disasters, *Chemical wastes, Aquatic animals, Mussels, Oysters, Absorption, Massachusetts, *Path of pollutants, Water pollution effects.
Identifiers: *Buzzards Bay (Mass).

The last few years public awareness of the problems of oil pollution has increased partly due to accidents like the 'Torrey Canyon' and the Santa Barbara disaster. Investigations of the oil tanker accident in Buzzards Bay near West Falmouth, Massachusetts in which 600 tons of diesel oil was spilled is discussed. Since the oil was relatively light weight it disappeared quickly from the surface, thus classing it as a 'minimal' spill. Biologists from Woods Hole had researched the area for years and were able to follow the oil effects and compare to pre-spill times. Two research stations were set up. Pollution appeared immediately in samples at the site nearest the accident but not until about 4 months later at the more distant site. Mussels and oysters, among other species absorbed the oil and even after long periods of time in fresh water still showed the effects of oil. (Brown-PAI)
W72-14670

RESEARCH ON THE DISTRIBUTION OF RADIOACTIVE FALL-OUT IN THE REGION OF THE NORTH SEA, SKAGERRAK AND THE WESTERN BALTIC SEA, (UNTER SUCHUNGEN UBER DIE VERTEILUNG DES RADIOAKTIVEN FALLOUT IM BEREICH DER NORDSEE, DE S SKAGERRAKS UND DER WESTLICHEN OSTSEE),
Deutsches Hydrographisches Institut, Hamburg (West Germany).
H. Kautsky.
Deutsche Hydrographische Zeitschrift, Vol 24, No 6, p 262-267, 1971. 3 fig, 2 tab.

Descriptors: *Radioactivity, *Fallout, Sampling, Distribution, Strontium, Cesium, *Nuclear explosions, Explosions, Nuclear wastes, Water pollution sources.
Identifiers: *North Sea, *Skagerrak, *Baltic Sea, *Strontium 90, *Cesium 137, Vertical distribution, Horizontal distribution.

Investigations on the distribution of radioactive fall-out were conducted by sampling water at 29 stations in the North Sea, the Skagerrak and the Western Baltic Sea. From 50-200 liter samples were studied in November 1967 for Strontium 90 and Cesium 137 concentrations. An overall view of the horizontal and vertical distribution of the artificial radio-active materials originating predominantly from atomic explosions is presented. (Ensign-PAI)
W72-14671

DISCOLORATION OF ALGAL BLOOMS AND SEAWEEDS (VEGETATIONSFARBUNGEN UND WASSERBLUTEN),
Oesterreichische Gesellschaft fuer Meteorologie, Vienna (Austria).
For primary bibliographic entry see Field 05C.
W72-14673

INVESTIGATIONS INTO THE DISTRIBUTION OF INORGANIC NITROGEN COMPOUNDS IN RELATION TO THE INCREASING DETERIORATION OF THE WATER IN THE BALTIC SEA (UNTERSUCHUNGEN UBER DIE VERTEILUNG DER ANORGANISCHEN STICKSTOFFVERBINDUNGEN I M HINBLICK AUF DIE ZUNEHMENDE WASSERVERSCHLECHTERUNG IN DER OSTSEE),
Deutsche Akademie der Wissenschaften zu Berlin, Rostock (East Germany). Institut fuer Meereskunde.
D. Nehring.
Beitrage zur Meereskunde, Berlin, Germany, No 28, p 57-74, 1971. 7 fig, 28 ref.

Descriptors: *Indicators, *Organic matter, *Mineralogy, *Nitrification, Ammonia, Nitrogen fixation, Organic loading, Inorganic compounds, *Path of pollutants, *Pollutant identification.
Identifiers: *Baltic Sea, *Lubecker Bight.

Investigations in the Baltic Sea showed that under certain conditions large amounts of ammonia and nitrogen appeared indicating an incomplete nitrification and that the previous organic load in these waters was not yet overcome. These pollution indicators proved that the groundwater flowing into the western and middle Baltic Sea in 1969 was heavily loaded with organic matter. The mineralization and nitrification of the materials stopped east of Bornholm. By the end of November of 1969 a strong organic load was observed in the Lubecker Bight indicative of deterioration of these waters. (Brown-PAI)
W72-14674

PETROLEUM HYDROCARBONS: UPTAKE AND DISCHARGE BY THE MARINE MUSSEL MYTILUS EDULIS,
Scripps Institution of Oceanography La Jolla, Calif.
For primary bibliographic entry see Field 05C.
W72-14683

PHENOXY HERBICIDE RESIDUES AND THEIR PERSISTENCE,
Midwest Research Inst., Kansas City, Mo.
W. B. House, L. H. Goodman, H. M. Gadberry, and K. W. Dockter.
Available from the National Technical Information Service as AD-726 367, $3.00 in paper copy, $0.95 in microfiche. December 1967. 18 p, 46 ref. DAHC 15-68-C-0119.

Descriptors: *Pesticide residues, *Herbicides, *2-4-5-T, *2-4-D, *Environment, *Chemcontrol, Pesticides, Pesticide kinetics, Soil treatment, Agricultural chemicals, Food chains, Diquat, Paraquat, Post-emergents, Pre-emergents, Phenolic pesticides, Public health, Aquatic environment, Water pollution sources, Water pollution effects, Degradation (Decomposition), Plant physiology.
Identifiers: *Phenoxy herbicide residues, MCPA, 4CPA, 2,4-DCP, Silvex, Amitrole.

Decomposition rates of various phenoxy herbicide residues, such as 2,4-d; 2,4,5-T; MCPA; 4 CPA; 2,4-DCP; and their esters, paraquat, diquat, silvex, and amitrole in soil, vegetation and water are discussed. Uses of the herbicides in agriculture, forestry, range, and water management and ensuing accumulation problems such as injury to sensitive crops that are grown in rotation, bioaccumulation, and leaching into the aquatic environment are considered. (Svensson-Washington)
W72-14687

TRANSFER OF MERCURY FROM FISHES TO SARCOSAPRO-PHAGOUS FLIES,
Helsinki Univ. (Finland).
P. Nuorteva, and E. Hasanen.
Annals of Zoology Fennici, Vol 9, p 23-27, 1972. 1 fig, 4 tab, 22 ref.

Descriptors: *Path of pollutants, *Mercury, *Larvae, Food chains, Water pollution effects, Fish, Public health.
Identifiers: *Bioaccumulation, *Flies (Sarcosaprophagous), Methyl mercury, Lucilia spp.

Sarcosaprophagous flies were reared from eggs to adults on fish containing 0.14, 0.17, 0.47 and 1.90 mg/kg of mercury. The transfer of mercury from the food to the larvae was followed by activation analysis. When fed on fish of the two lowest ('-natural') levels of mercury, the fly larvae had the same mercury content as their food. With a mercury content of 0.47 mg/kg in the fish the full grown fly larvae had 0.62 mg/kg, while with a mercury content of 1.90 mg/kg in the fish the full grown larvae contained 6.90 mg/kg, which is a clear indication of bioaccumulation. It is suggested that fly larvae are capable of inhibiting the bioaccumulation of mercury only if it is present in the food in 'normal' concentrations. When the larvae were given mercury contaminated (9.07 - 10.62 mg/kg) adult flies as their food for a short period, their mercury content rose from low level to 11.40 mg/kg. Because of the weight loss caused by evaporation and respiration during the pupal stage, the mercury content of the adult flies was about 1 1/2 times as high as that of the full grown larvae. Free living fly population in general had low mercury contents (0.02 - 0.06 mg/kg), except for one sample (0.50 mg/kg) collected on the shore of a mercury polluted lake at a place where fish are regularly cleaned. (Svensson-Washington)
W72-14701

ABSENCE OF POLYCHLORINATED BIPHENYLS IN HUMAN MILK AND SERUM FROM TEXAS AND HUMAN MILK FROM NEW GUINEA,
William Beaumont General Hospital, El Paso, Tex.
P. G. Dyment, L. M. Hebertson, E. D. Gomes, J. S. Wiseman, and R. W. Hornabrook.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 6, p 532-534, 1971. 6 ref. PH 86-65-73.

Descriptors: *Pesticide residues, *Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, *Public health, Path of pollutants, Pesticides, DDT, DDE, Insecticides, Gas chromatography, Bioassay, *Texas.
Identifiers: *Human contamination, Milk (Human), Serum (Human), *New Guinea, Industrial pollutants.

The degree of human contamination by PCB's was investigated by assaying human milk and serum from an industrialized society (Texas) and human milk from a, until recently, stone age culture (New Guinea natives). Despite the detection of chlorinated hydrocarbon insecticides in all of the Texas samples, no PCB's were detected in either the milk or the serum. Neither were any detected in the milk from New Guinea natives, although DDT and DDE were detected in all but one of them. The lack of other insecticides in these latter samples can be attributed to the exclusive use of DDT in malaria eradication programs. Because PCB's are lipid soluble, it could be assumed that if they were present in the human body in detectable amounts, they could be recovered from lipid-containing tissue such as milk or serum. Their total absence from these samples would suggest that although PCB's are widespread industrial pollutants, they are not yet significantly contaminating humans. (Svensson-Washington
W72-14708

MONITORING OF ORGANO-CHLORINE RESIDUES IN FISH FROM AROUND ENGLAND AND WALES, WITH SPECIAL REFERENCE TO POLYCHLORINATED BIPHENYLS (PCBS),
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
J. E. Portmann.
International Council for the Exploration of the Sea, Fisheries Improvement Committee, C. M. 1970/E:9, 1970. 5 p, 2 tab, 9 ref.

Descriptors: *Marine fish, *Shellfish, *Assay, *Monitoring, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, Herring, Pesticide toxicity, Pesticide residues, Coasts, Mussels, Aquatic environment, Water pollution effects, Aroclors, DDE, DDT, DDD, Aldrin, Dieldrin, Endrin, Heptachlor.
Identifiers: Cod, Whiting, Plaice, BHC, Clophen.

An on-going routine monitoring program is described, involving sampling cod, whiting, plaice and herring landed at nine fishing ports around England and Wales on a twice-yearly basis. Similarly, the sampling of shellfish, particularly mussels, is also being done. Residues of the following organochlorine pesticides: alpha and gamma BHC, DDT, TDE, DDE, aldrin, dieldrin, endrin and heptachlor epoxide are monitored. Concentrations of PCB's in the material obtained for organo-chlorine analysis are also estimated. The main objectives of this program are to establish the levels of these residues in fish and shellfish, the possible differences in concentrations with area or type of fish, and whether the levels have been decreasing or increasing. In addition it was hoped that in conjunction with toxicity tests it would be possible to assess the danger posed to fish by these residues. Results of assays and toxicity tests are presented in tabular form. (Svensson-Washington)
W72-14711

BIOLOGICAL MONITORING OF THE EFFLUENT FROM A LARGE CHEMICAL WORKS IN A RIVER WHICH HAS SOURCES OF POLLUTION UPSTREAM,
Canadian Industries, Ltd. Montreal (Quebec). Engineering Dept.
For primary bibliographic entry see Field 05A.
W72-14713

MONITORING MERCURY VAPOR NEAR POLLUTION SITES.
Environmental Measurements, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 05A.
W72-14714

GROUND-WATER RESOURCES OF ORANGE AND ULSTER COUNTIES, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-14726

CHRONOLOGY OF THE BLACK SEA OVER THE LAST 25,000 YEARS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-14732

MOLYBDENUM, ARSENIC, AND OTHER ELEMENTS IN STREAM SEDIMENTS, TOMAH MOUNTAIN, TOPSFIELD, MAINE,
Geological Survey, Washington, D.C.
G. A. Nowlan, and T. D. Hessin.
Geological Survey Open-file Report, 1972. 18 p, 4 fig, 2 tab, 4 ref.

Descriptors: *Bottom sediments, *Trace elements, *Molybdenum, *Arsenic compounds, *Maine, Streambeds, Water chemistry, Streams, Geology, Rocks, Sampling, Chemical analysis, Analytical techniques, Data collections, Water pollution sources.
Identifiers: *Washington County (Maine).

The molybdenum and arsenic content of stream sediments is usually high in streams draining the general area of contact between the Devonian Bottle Lake Quartz Monzonite and Silurian metasedimentary rocks near eastern Tomah Mountain, Washington County, Maine. Anomalous values of molybdenum are commonly, but not exclusively, found in stream sediments containing hydrous manganese-iron oxides. High values of arsenic are found in stream-sediment samples containing hydrous manganese-iron oxides but all of the samples containing the oxides do not contain high amounts of arsenic. The anomaly is probably not due solely to the element-scavenging properties of the hydrous manganese-iron oxides. Very sparse molybdenite was found in an outcrop of igneous rock within the drainage basin of an anomalous stream. (Woodard-USGS)
W72-14733

BEHAVIOR OF BERYLLIUM SULFATE IN HARD AND SOFT WATER,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
A. R. Slonim.
Available from NTIS- Springfield, Va. 22151, as AD-739 888, Price $3.00 Paper copy; $0.95 in microfiche. Aerospace Medical Research Laboratory Technical Report 71-100, December 1971. 22 p, 3 fig, 9 tab, 18 ref.

Descriptors: Water pollution sources, *Beryllium, *Sulfates, *Analytical techniques, Hydrogen ion concentration, Water chemistry, Water properties, *Chemical reactions, Laboratory tests, *Chemical analysis, Turbidity, Dissolved oxygen.
Identifiers: *Hard water, *Soft water, Buffering.

The interaction of beryllium with hard and soft water represents the first phase of a study of beryllium effects on water and fish. The pH of BeSO4 in soft water is significantly lower than in hard water in the concentration range of beryllium from 0.01 to 100 mg/liter. An insoluble complex forms only in hard water within a limited beryllium concentration range (1.50 mg/liter). Water hardness is a significant determinant of the pH of beryllium solutions. The amount of NaHCO3 needed to buffer varying amounts of concentrated (acidic) beryllium solutions is compared on a molar basis between soft and hard water. Beryllium has no effect on the hardness or dissolved oxygen content of either test water, but shows greater changes in conductivity of soft water than hard water. The absence of any appreciable beryllium effect on seven characteristics of soft or hard water over a 96-hour period supports the feasibility of running a static bioassay on beryllium in the laboratory. (Woodard-USGS)
W72-14744

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 14,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-14746

NUTRIENT SURVEY OF SURFACE WATERS IN SOUTHERN FLORIDA DURING A WET AND A DRY SEASON, SEPTEMBER 1970 AND MARCH 1971,
Geological Survey, Washington, D.C.
H. J. Freiberger.
Geological Survey Open-file Report 72008, 1972. 29 p, 5 fig, 8 ref.

Descriptors: *Chemical analysis, *Nutrients, *Surface waters, *Florida, Surveys, Phosphates, Ammonium compounds, Nitrites, Nitrates, Wet seasons, Dry seasons, Water pollution sources, Data collections, Water quality, Analytical techniques, Pollutant identification.
Identifiers: *Southern Florida.

A mass nutrient survey of southern Florida surface waters was made in September 1970, during a period of high water, and again in March 1971, during a period of low water. Water samples were analyzed by automated chemical techniques for total ortho plus acid-hydrolyzable phosphorus (P-PO4) ammonia nitrogen (NH3-N), nitrite nitrogen

(NO2-N), and nitrate nitrogen (NO3-N). Phosphorus concentration averaged about 0.50 mg/liter during the wet season; the average concentration was slightly higher during the dry season. At one site in Broward County near a point of sewage outfall, the concentration was 45 mg/liter during the dry season. Ammonia was the most prevalent form of nitrogen detected. Concentrations of NH3-N ranged from less than 0.01 to 25 mg/liter in the dry season. Nitrite and nitrate concentrations were generally low in both wet and dry seasons. Nitrite ranged from less than 0.01 to 0.70 mg/liter during the wet season and slightly lower in the dry season. Most nitrate concentrations were below 0.20 mg/liter during the wet and dry seasons. (Woodard-USGS)
W72-14750

EFFECTS OF CERTAIN PARAMETERS ON BACTERIAL POLLUTION AT A COASTAL SITE,
Water Pollution Research Lab., Stevenage (England).
A. L. H. Gameson, D. Munro, and E. B. Pike.
Presented to Institute of Water Pollution Control Symposium on Water Pollution Control in Coastal Areas, Bournemouth, May 1970. 20 p, 13 fig, 2 tab, 10 ref. Water Pollution Research Laboratory Reprint No. 587.

Descriptors: *Mathematical models, *Correlation analysis, *Coliforms, *Coasts, *Water pollution sources, Tidal effects, Winds, Seasonal, Sewage effluents, Bacteria, Path of pollutants, Model studies.
Identifiers: Sea state.

In an attempt to develop a predictive model for estimating the pollutional effects of a sewer emptying into the sea, measurements of coliform bacteria were taken periodically over a period of two years. Sampling stations were located along the shingle, sand and gravel beach for a distance of 1.2 kilometers in one direction and 1.7 kilometers in the other. Results indicate that general estimates can be made based on tidal state, wind, sea state, season, sewage strength and distance from the outfall. The influence of the above factors varies between measurement stations. The Fickian dispersion model was used with numerical values assigned based on the most relevant data. Further observations resulted in changes in these values which provide a model that is only approximate. Attempts to relate discrepancies between observed and calculated values to the pollutional effects of three rivers in the area were inconclusive. Nevertheless, the predictions were not entirely unsuccessful and the discussions illustrate the difficulties in predictive methods. (Goessling-Texas)
W72-14817

BOD DETERMINATIONS ON FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-14819

FACTORS AFFECTING OXYGEN TRANSFER IN THE ELECTROLYSIS BOD SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-14820

A THIRD YEAR OF OBSERVATIONS ON THE CONTRIBUTION OF NUTRIENT SALTS OF SOME WATERCOURSES FLOWING INTO THE ADRIATIC,
Bologna Univ. (Italy). Instituto di Zoologia; and Laboratorio di Biologica Marine e Pesca, Fano (Italy).
M. V. Olmo, and M. P. Molinas.
Note Lab Biol Mar Pesca-Fano. Vol 3, No 8, p 177-221. 1970. Illus. Map. English summary.
Identifiers: *Adriatic Sea, Fano (Italy), Nutrients, *Chemical properties, Phosphates, Nitrates, Nitrites, Nitrogen compounds.

Data are presented on the quantitative analysis of soluble phosphates, ammonia salts, nitrates and nitrites flowing into the Adriatic Sea near Fano, Italy, obtained from 1967-1969. The areas studied are in the vicinity of the Metauro and Arzilla water courses.--Copyright 1972, Biological Abstracts, Inc.
W72-14822

RELATIVE POLLUTION STRENGTHS OF UNDILUTED WASTE MATERIALS DISCHARGED IN HOUSEHOLDS AND THE DILUTION WATERS USED FOR EACH,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. Laak.
Available from the National Technical Information Service as PB-212 363, $3.00 in paper copy, $0.95 in microfiche. Completion Report 1972. 15 p, 9 tab, 11 ref. OWRR A-025-CONN (1).

Descriptors: *Domestic wastes, *Pollutant identification, *Waste water (Pollution), *Detergents, *Plumbing, Recycling, Ammonia, Nitrogen, Biochemical oxygen demand, Chemical oxygen demand, Water utilization, Sanitary engineering, Inorganic compounds, Phosphates.
Identifiers: *Pollutional load budget, *Recycle system design, Consumer products.

By keeping records, weighing the quantities of consumer products used in 5 households and measuring the water used for each plumbing fixture a detailed pollutant budget was obtained. Laboratory analysis for consumer brands used and actual samples of the wastewater for BOD, COD, ammonia, Kjeldahl and nitrate nitrogen, and inorganic phosphates are presented in table form for design of recycle systems, estimating pollution loads and for calculating the impact of consumer brands changes. Consumer products contributed less than 50% of the total pollution load. About half of the waste flow, 90% of the nitrogen, 60% of COD and 50% of phosphates were contributed by toilet wastes. Effective environmental protective measures appear to be reduction or elimination of water carried toilet systems and partial recycling of water between bathing and laundry.
W72-14839

A CHEMICAL ANALYSIS OF THE EARTHY--MUSTY ODOR IN WATER,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05A.
W72-14841

A PRE-IMPOUNDMENT STUDY OF THE NORTH ANNA RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
M. Simmons, Jr.
Available from the National Technical Information Service as PB-212 380, $3.00 in paper copy, $0.95 in microfiche. Virginia Water Resources Research Center Bulletin 55, August 1972. 76 p, 20 fig, 7 tab, 11 append. OWRRA-031-VA (3).

Descriptors: *Water quality, *Acid mine water, Benthic fauna, Aquatic animals, Water pollution sources, *Virginia.
Identifiers: Aquatic ecology, *North Anna River (Va).

Virginia Electric and Power Company has completed a nuclear powered electrical generating facility on the North Anna River in Louisa County, Virginia, with a 14,500 acre reservoir serving as a coolant. Pre-impoundment studies have been completed on the evaluation of the existing macrobenthic community and water quality conditions in the impoundment basin. Analyses of the diversity index and structure of the macrobenthic community show that while the river was severely affected by acid mine drainage from a major tributary, Contrary Creek, the polluted zone is in a recovery phase. Chronic siltation from Contrary Creek is presented as the primary factor restricting complete recovery. A project supported by the power company revealed that the point of biological recovery was at the confluence of the North Anna and South Anna rivers, approximately 40 miles from Contrary Creek and 19 miles from the dam site.
W72-14846

POLLUTION INSTRUMENTATION TECHNIQUES,
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 05A.
W72-14855

LEAD-DEADWOOD SANITARY DISTRICT NUMBER 1, SOUTH DAKOTA (FINAL ENVIRONMENTAL STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 05D.
W72-14924

TEST TO DETERMINE THE COMBINED EFFECTS OF WAVES AND CURRENTS ON BARRIER MOTIONS AND OIL RETENTION EFFICIENCY IN ROUGH WATER. POINT CONCEPTION, CAL. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-14937

DYE DISPERSION PATTERNS FOR THREE OUTFALL LOCATIONS FOR THE WARWICK RIVER SEWAGE TREATMENT PLANT: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb, and N. J. Brogdon, Jr.
Available from NTIS, Springfield, Va. 22151 as AD-738 802 - Price $3.00 in paper copy; $0.95 cents microfiche. Miscellaneous Paper No 2-951, December 1967. 20 p, 88 plate, 1 tab.

Descriptors: *Water pollution sources, *Sewage effluents, *Estuaries, *Model studies, *Virginia, Dye releases, Sampling, Path of pollutants, Tracers, Fluorescent dye, Tracking techniques, Data collections.
Identifiers: *James River estuary (Va).

A fixed-bed model of the James River estuary and its tributaries, which reproduced tides, currents, and salinities, was used to determine the dispersion characteristics and areas of influence of sewage effluent from three proposed locations for a sub-aqueous outfall for the Warwick River treatment plant. The outfall locations tested were 3,800 ft, 8,000 ft, and 12,000 ft from shore, and effluent discharge rates equivalent to 5 million gallons per day (mgd) and 15 mgd were tested at each outfall location. Two fluorescent dyes, adjusted to an initial concentration of 1,000,000 parts per billion, were injected at the proper rate to simulate either the low or the high effluent discharge rate. Water samples were collected from surface and bottom depths at times of local tidal high- and low-water. Both the dispersion rate and the area of influence increased when the outfall location was shifted from 3,800 ft to 8,000 ft from shore. Shifting the outfall an additional 4,000 ft to a point 12,000 ft from shore had very little further effect. The maximum concentration was in the Warwick River

with a 15 mgd discharge rate from the outfall located 3,800 ft from shore. (Woodard-USGS)
W72-14951

PRELIMINARY STUDIES IN THE TERRESTRIAL DISPOSITION OF SILVER FROM CLOUD SEEDING,
Colorado State Univ., Fort Collins. Dept. Watershed Science.
H. L. Teller, and D. R. Cameron.
Water Resources Bulletin, Vol 8, No 4, p 715-723, August 1972. 4 fig, 3 tab, 12 ref.

Descriptors: *Path of pollutants, *Silver iodide, *Cloud seeding, *Environmental effects, *Colorado, Weather modification, Trace elements, Sampling, Chemical analysis, Distribution patterns, Monitoring.

Silver levels in soil, plant and litter material are being monitored twice a year on a mountainous area in southwestern Colorado, to determine whether annual accretion from cloud seeding can be measured with current techniques and whether significant changes in silver concentration take place in grass, aspen, and spruce communities. One AgI generator site is also being monitored. No measurable increase was found after the first winter's seeding. On an ash basis, spruce foliage and litter contain about four times as much silver as soil. On a dry weight basis, soil from all three plant communities contains about six times as much silver as foliage. Consistent increases in silver concentration were found in soil and pine foliage within 200 meters of one generator site. (Knapp-USGS)
W72-14953

FEASIBILITY STUDY OF CHEMICAL SEALING OF SOILS,
Diamond Alkali Co., Painesville, Ohio.
W. T. Gooding, Jr., A. D. Bergmann, and C. G. Vinson.
Available from the National Technical Information Service as PB-206 018, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 266, June 1967. 31 p, 7 fig, 3 tab, 12 ref, 3 append. Contract 14-01-0001-649.

Descriptors: *Brine disposal, *Soil treatment, *Evaporation, *Ponds, *Permeability, Soil chemical properties, Saline water, *Sealants.
Identifiers: *Soil mixes, Permeability cell tests, Soil sealants, Solar ponds.

Chemically sealing of soils was evaluated in the laboratory to determine the rate of permeation of various soils and chemicals. Permeability tests showed that several formations of Roswell, New Mexico soil have casagrande permeabilities of 0.1 foot per year or less. The cheapest of the formulations studied contained 0.3 weight percent sodium silicate. Sodium silicate mixes were considered to be ready for field testing. Measurements were conducted by moistening and compacting mixtures of the Roswell soil and the chemical sealant to a depth of 2.5 inches in permeability cells. Rates of brine permeation through the cells were measured under pressure differential of about 10 psi. (OSW abstract)
W72-15000

5C. Effects of Pollution

THE ECOLOGY OF THE SILVERJAW MINNOW, ERICYMBA BUCCATA COPE,
Eastern Michigan Univ., Ypsilanti. Dept. of Biology.
D. C. Wallace.
Am Midl Nat. Vol 87, No 1, p 172-190. 1972. Illus.
Identifiers: Behavior, Ecology, *Ericymba buccata, Minnow, *Pimephales notatus, *Silverjaw minnow, *Otter Creek (Ind), Indiana, Turbidity, *Mine wastes.

A study of the ecology of E. buccata Cope, in Otter Creek, Vigo Co., Indiana, was based on random samples taken over a period of 1 yr. This method enabled analysis of temporal and spatial changes in the occurrence of this species with respect to the environmental factors measured. Comparisons between the ecology of E. buccata and Pimephales notatus (Rafinesque) were drawn. Ericymba was the most abundant species in this relatively small, soft-bottomed stream. It usually occurred in non-wooded areas, over sand or sand-and-fine-gravel bottoms, in situations between 6 in. and 2.5 ft deep, and 16 to 40 ft wide with current speeds less than 1.5 fps (ft/sec). Certain aspects of its physiology and behavior are adaptive to these conditions. Although commonly associated with P. notatus, the next most abundant species, the occurrence of the silverjaw minnow was less narrowly defined with regard to depth and flow. Pimephales occurred at significantly higher densities in 'slow flow-deep' areas than in 'moderate flow-shallow' areas. In contrast, the silverjaw minnow occurred at essentially the same densities in both of these situations and at much higher densities than the bluntnose minnow in the 'moderate flow-shallow' areas. Although Erycimba has a high tolerance to turbidity and mine wastes, its numbers are reduced where turbidity and mine wastes have deposited silt layers over otherwise habitable stream bottoms. This species apparently moves into somewhat deeper water in the winter and remains there during early spring. Based on densities of occurrence it appears that young-of-the-year tend to move downstream in the autumn and remain there as yearlings until sometime the following autumn when they move upstream.--Copyright 1972, Biological Abstracts, Inc.
W72-14206

WATER RELATIONS IN LIVING, DEAD, AND CELLULOSE MODELS OF THE LICHEN UMBILICARIA PAPULOSA,
Ohio State Univ. Hospitals, Columbus.
R. E. Showman, and E. D. Rudolph.
Bryologist, 74 (4): 444-450, Illus, 1971.
Identifiers: Algal layer, *Cellulose models, *Lichens, Staining, *Umbilicaria-Papulosa, Water.

Water relations of living lichens, dead lichens, and cellulose model lichens were studied at different relative humidities. An air flow system allowed instantaneous weight measurement while water uptake or loss was occurring. In all cases, living lichens had the greatest uptake rates, followed by dead lichens and cellulose models. Nonaqueous staining techniques showed that in living, but not in dead lichens, most of the water is held in the algal layer. The processes of water vapor uptake and water loss are apparently physical, and the differences in rates can be explained by differences in the physical properties of the test materials.--Copyright 1972, Biological Abstracts, Inc.
W72-14247

TRUMBULL LAKE, PEQUONNOCK RIVER, TRUMBULL, CONNECTICUT (UPDATED FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-14278

DOG RIVER, MOBILE BAY, ALABAMA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14279

LIMNOLOGICAL EFFECTS OF SIMULATED PUMPED-STORAGE OPERATION AT YARDS CREEK,
Delaware River Basin Commission, Trenton, N.J.
C. F. Baren.
December 1971. 158 p, 36 fig, 31 tab, 103 ref.

Descriptors: *Water level fluctuations, *Pumped storage, Physicochemical properties, *Plankton, *Aquatic plants, *Aquatic animals, *Model studies, Limnology, Biological properties, Mineralogy, Fish, Fish behavior, Chemical analysis, Sampling, Volumetric analysis, Algae, Reservoir storage, Impoundments, Dissolved oxygen, Chlorides, Invertebrates, Hardness (Water), Turbidity, Alkalinity, Carbon dioxide, Phosphorus, Nitrogen, Silica, Copper, Sulfates, Iron, Manganese, Spawning, Fish reproduction, Life history studies, Phytoplankton, Standing crop, Biomass, Sport fish, Zooplankton, Water temperature, Air temperature, Juvenile fishes, Fry, Plankton nets, Nets, Sunfishes, Bass, Rock bass, Diatoms, Chrysophyta, Bullheads, Shiners, Yellow perch, Walleye, Minnows, Protozoa, Rotifers, Brook trout, Rainbow trout, Pikes, Striped bass, Chlorophyta, Euglenophyta, Phrrophyta, Euglena, Cyanophyta, Crustaceans, Copepods, Nesting, Brown trout, Scenedesmus, Dinoflagellates, Larvae, Daphnia, Midges, Caddisflies, Gastropods, Pondweeds, New Jersey, Delaware River, Nutrients, Primary productivity, Secondary productivity.
Identifiers: Macroinvertebrates, *Tocks Island Reservoir (NJ), American shad, Ekman dredge, Pumpkinseed, Black crappie, Chain pickerel, Tendipes tentans, Trichoptera, Limnephilus, Glossosoma, Physa gyrina, Kemmerer sampler, Secchi *Yards Creek (NJ), Relative condition factor.

A pumped-storage power generating systems which would alter water levels has been proposed for inclusion in the Tocks Island Reservoir project at Blairstown, New Jersey. Results are reported of a two-year study to determine what effects changing water levels might have on aquatic biota. Four t disc,est ponds were constructed in the vicinity of the planned project to investigate: (1) the effects of diurnally fluctuating water levels on the life history of selected, native nest-building and non-nest-building fish; (2) the physical and chemical characteristics of variously fluctuated test ponds; (3) the resulting effects of fluctuating water levels on macroinvertebrates, plankton, and aquatic plants; and (4) the consequent combined effects of physicochemical characteristics and changing water levels on the behavior of the selected fishes. It was found that (1) fish adapted to the uniform regime of water level fluctuations and were successful in spawning and hatching eggs and (2) the measurable effects observed in plankton and macroinvertebrate productivity, plant colonization, relative condition factors of fish, and the physical and chemical properties of the test pond had no marked effect on the fish populations. The results of the physiochemical analyses and profiles, the plants and animals studied, and sampling procedures utilized in the study are included in figures, tables and appendices. (Holoman-Battelle)
W72-14280

CONFERENCE IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES--INDIANA-MICHIGAN-NEW YORK-OHIO-PENNSYLVANIA: VOLUMES 1 AND 2.
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14282

HISTOLOGICAL CHANGES IN LOBSTERS (HOMARUS AMERICANUS) EXPOSED TO YELLOW PHOSPHORUS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. E. Aiken, and E. H. Byard.

Science, Vol 176, No 4042, p 1434-1435, June 30, 1972. 1 fig, 8 ref.

Descriptors: *Phosphorus, *Toxicity, *Lobsters, Industrial wastes, Water pollution effects, Fishkill, Canada, Cytological studies, Sea water, Microscopy.
Identifiers: *Yellow phosphorus, Homarus americanus, Histology, Hepatopancreas, Antennal gland, Tissue, Arthropods, Macroinvertebrates, Biological samples, Sample preparation,Sample preservation.

An analysis of tissue samples from lobsters killed by phosphorus reveals pronounced histological changes in the hepatopancreas. Variable destruction of parts of the antennal gland was also evident. Tissues were taken from 18 phosphorus contaminated lobsters and from two control lobsters that were asphyxiated in oxygen-free seawater. The tissues were fixed in Bouin's fluid and stored in 70 percent ethyl alcohol. The tissue was stained with Delafield's hematoxylin and one percent aqueous eosin. Tissue from a second control group of 18 lobsters was stained and mounted without storage. Antennal gland degeneration was evident to some degree in all but one of the exposed lobsters and in none of the controls. The phosphorus caused degeneration in all four cell types in the hepatopancreas. A characteristic way of dying was also observed in the lobsters exposed to lethal doses of yellow phosphorus. (Mortland-Battelle)
W72-14284

CHLORINATION OF POWER PLANTS: IMPACT ON PHYTOPLANKTON PRODUCTIVITY,
Minnesota Univ. Minneapolis. Dept. of Ecology and Behavioral Biology.
A. J. Brook, and A. L. Baker.
Science, Vol 176, p 1414-1415, June 30, 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Phytoplankton, *Chlorination, *Respiration, Water pollution effects, *Primary productivity, Powerplants, Rivers, *Photosynthesis, *Thermal pollution, Water temperature, Sewage treatment, Chlorine, Incubation, Dissolved oxygen, Volumetric analysis, *Minnesota, Environmental effects.
Identifiers: Light and dark bottle technique, *St. Croix River (Minn).

Photosynthesis and respiration rates were measured to determine the effects on river phytoplankton productivity of passage through a power plant. Three hundred-ml samples were taken in the St. Croix River near the Allen S. King power plant in Minneapolis. The photosynthesis and respiration rates were determined by the light-dark bottle incubation technique and changes in the amounts of dissolved oxygen were measured by Winkler titration. The studies indicated that chlorination depresses photosynthesis and respiration to a much greater extent than does heating of the water. (Mortland-Battelle)
W72-14285

EFFICACY, TOXICITY, AND RESIDUES OF NIFURPIRINOL IN SALMONIDS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
D. F. Amend.
Technical Paper No 62, April 1972. p 3-13, 4 fig, 3 tab, 13 ref.

Descriptors: *Toxicity, *Fish diseases, *Animal pathology, *Salmonids, Pathogenic bacteria, Water temperature, Hardness (Water), Mortality, Lethal limit, Freshwater fish, Antibiotics (Pesticides), Bactericides, Pesticide residues, Chinook salmon, Rainbow trout, Carp, Bullheads, Sunfishes, Bioassay, Water pollution effects, Physicochemical properties.
Identifiers: *Nifurpirinol, Drugs, Sample preparation, Tissue, Biological samples, Chondrococcus columnaris, Furunculosis, Aeromonas salmonicida, Coho salmon, Oncorhynchus kisutch, Myxobacteriosis, Cytophaga psychrophila, Oncorhynchus tschawytcha, Virbrio anguillarum, Muscle, Blood, Skin, Kidneys, Liver, Salmo gairdneri.

Nifurpirinol (NFP) was tested for control of furunculosis, myxobacterioses, and vibriosis, and for effects on rainbow trout, coho, and chinook salmon under various conditions. The elimination of NFP from various tissues of coho salmon at 45C and 70C was measured. Furunculosis in coho salmon was partially controlled with 2 daily 1-hour baths at 8 or 10 ppm NFP; it was not controlled by feeding the drug because the fish refused to eat the medicated food. Excellent control of myxobacterioses (columnaris, cold-water disease, myxobacterial gill disease, followed 1 or 2 daily 1-hour treatments at 1 ppm NFP. Preliminary tests indicated that loss of chinook salmon due to vibrosis could be reduced with NFP fed at 50 to 75 mg/kg per day for 14 days. The reason chinook salmon ate the medicated food and coho salmon did not is not known. The toxicity of NFP to cohos varied directly with dosage level, treatment frequency, and water temperature. Single 1-hour exposures were not toxic at levels up to 10 ppm, but repeated exposures to 6 ppm or higher at 24-hour intervals resulted in increased mortality. Toxicity was greater at higher water temperatures. Results were similar with chinook salmon and rainbow trout. NFP was eliminated from all tissues of cohos within 9 days following 3 daily 1-hour exposures at 2 ppm at both 45 and 70C. The highest levels occurred in the liver and kidney, and it expecially accumulated in these tissues at 45C. Muscle, serum, and skin drug levels were highest immediately following treatment, but were undetectable after 48 hours. It was concluded that NFP administered as a 1-hour bath to cohos at 1 ppm on 1 to 3 consecutive days will effectively control myxobacterial diseases. It is of low toxicity and poses no residue problems 9 days after the last treatment. (Mortland-Battelle)
W72-14286

MORPHOLOGY AND ENZYME HISTOCHEMISTRY IN THE LIVER OF LARGEMOUTH BASS (MICROPTERUS SALMOIDES),
Louisville Univ., Ky. Dept. of Anatomy.
D. E. Hinton, R. L. Snipes, and M. W. Kendall.
Journal Fisheries Research Board of Canada, Vol 29, No 5, p 531-534, May 1972. 10 fig, 16 ref.

Descriptors: *Enzymes, Bass, Microscopy, Electron microscopy, Fish diseases, Fish physiology, Sampling, Freshwater fish.
Identifiers: *Histochemistry, *Liver, *Largemouth bass, *Morphology, Glucose-6-phosphatase, Micropterus salmoides, Tissue, Biological samples, Sample preparation, Alkaline phosphatase, Histology.

A description is given of the morphology and enzyme histochemistry of the liver of the largemouth bass (Micropterus salmoides). Twenty-seven bass were collected from streams and an impoundment in Kentucky by electroshocking. Rapid streamside dissections were performed and the livers were placed in appropriate solutions for subsequent examinations: light and electron microscopy and enzyme histochemistry. The connective tissue framework of the liver was primarily collagen and reticulum. Elastic lamellae were seen in hepatic arteries. Hepatic parenchyma was arranged in dual-plated muralia. Hepatocytes contained glycogen, endoplasmic reticulum, mitochondria, and a homogeneous nucleus with one prominent nucleolus. Pancreatic acini were observed in walls and perivascular connective tissue of portal veins. No distinct lobular pattern of parenchyma was observed. The enzyme glucose-6-phosphatase was abundant in cytoplasm of hepatocytes usually forming a perinuclear cuff. Alkaline phosphatase was determined in the sinusoidal border of hepatocytes and in walls of central veins. Differentiation of portal veins from central veins was made on the basis of proximity to the hepatic artery and bile duct. (Byrd-Battelle)
W72-14288

DISTRIBUTION OF HERRING (CLUPEA HARENGUS) LARVAE ALONG THE SOUTHERN COAST OF NOVA SCOTIA WITH OBSERVATIONS ON THEIR GROWTH AND CONDITION FACTOR,
Bedford Institute, Dartmouth (Nova Scotia).
D. D. Sameoto.
Journal Fisheries Research Board of Canada, Vol 29, No 5, p 507-515, May 1972. 8 fig, 2 tab, 17 ref.

Descriptors: *Growth rates, *Spatial distribution, *Fish physiology, *Larval growth stage, *Ecological distribution, Water pollution effects, Herrings, Copepods, Water quality, Zooplankton, Mortality, Biomass, Sea water, Fish populations, Sampling, Marine fish, Equipment, Coasts, Statistical methods, Bioindicators, Maine, Atlantic Ocean, Water pollution, Pollutant identification, Reproduction, Spawning.
Identifiers: *Clupea harengus, *Nova Scotia, Condition factor, Sample preservation, Sample preparation, St. Margaret's Bay, North Sea, Baltic Sea, Clyde Sea.

The distribution of herring (Clupea harengus) larvae along the southern coast of Nova Scotia was studied in relation to their growth and condition factor. Herring larvae and zooplankton samples were collected and the condition factors calculated to be used as indicators of high or low potential of larval mortality. During the fall and winter, the condition factor and growth rate of herring larvae were studied and compared to that of herring larvae from the coast of Maine, and from parts of the North, Baltic and Clyde Seas to determine if the environment on the coast of Nova Scotia was as favorable to the larvae as those mentioned above. The distribution and abundance of herring larvae on the southern coast of Nova Scotia suggested the presence of a fall spawning population. Larvae were found in St. Margaret's Bay from late September to June. They showed a slower growth rate than larvae from the Clyde Sea, Scotland, and weighed less at a particular length than did larvae from the Clyde Sea and Boothbay, Maine. The larvae had a lower condition factor at 25 mm length than larvae from the North and Baltic Seas. No larvae were found on the Scotian Shelf during late May and early June, 1969, but were abundant during September and October. Herring spawning beds were reported from areas along the entire coast of Nova Scotia from Canso to Cape Sable. (Byrd-Battelle)
W72-14289

EFFECT OF THERMAL STRESS ON PREDATOR AVOIDANCE IN SOCKEYE SALMON,
Washington Univ., Seattle. Coll. of Fisheries.
J. R. Sylvester.
Journal Fisheries Research Board of Canada, Vol 29, No 5, p 601-603, May 1972. 1 fig, 10 ref.

Descriptors: *Thermal stress, *Prey fish, *Predation, *Sockeye salmon, *Environmental effects, Mortality, Fishkill, Heated water, *Thermal pollution, Water temperature, Aquaria, Fish behavior, Water pollution effects, Laboratory tests, Salmon, Fry, Freshwater fish.
Identifiers: Oncorhynchus kisutch, Oncorhynchus nerka, Coho salmon, Survival.

Experiments were performed to examine the effect of moderate and severe thermal doses of short duration on the ability of sockeye salmon fry, Oncorhynchus nerka, to avoid predation by yearling coho salmon, Oncorhynchus kisutch, in laboratory

aquaria. Predators and prey were divided into three groups; each group was acclimated in holding tanks to water temperatures of 7, 12, or 17 C for at least 2 weeks before tests. All fish were held under a constant photoperiod. Tests were conducted in insulated tanks containing dechlorinated water at an acclimation temperature of plus or minus 0.5 C. Dissolved oxygen was maintained at 80-90 percent of air saturation values. Eight prey and two predators acclimated to the same temperature were randomly selected from the holding tanks for each test. A control series and two experimental series of tests were conducted at each acclimation temperature to study the effect of thermal doses of short duration on the prey. Tests in each series were replicated eight times. Under laboratory conditions, predation rates of yearling coho salmon on sockeye salmon fry increased with increasing acclimation temperature. Elevated temperature doses significantly decreased survival of sockeye salmon fry. The results suggest that under natural conditions, sudden increases in water temperature could alter predator-prey interactions of some fish by increasing predation mortalities. (Byrd-Battelle)
W72-14290

MICROBIAL UPTAKE OF LEAD,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
T. G. Tornabene, and H. W. Edwards.
Science, Vol 176, No 4041, p 1334-1335, June 23, 1972. 2 tab, 15 ref.

Descriptors: *Cytological studies, *Lead, *Bacteria, *Absorption, Bromides, Chlorides, Iodides, Salts, Cultures, Spectrophotometry, Turbidity, Centrifugation, Proteins, Lipids, Spectrometers, Incubation, Membranes, Food chains, Absorption, Path of pollutants.
Identifiers: *Lead compounds, *Biological magnification, Lead bromide, Lead iodide, Lead bromochloride, Azotobacter, Micrococcus luteus, RNA, Hexosamine, Atomic absorption spectrophotometry.

A study was made of the immobilization of inorganic lead by microbial cells and the fraction of immobilized lead that passes through the cell envelope into the cytoplasm. This immobilization may be important to transfer through the food chain. Azotobacter sp. and Micrococcus luteus were grown in broth in the presence of lead bromide, lead iodide, and lead bromochloride. Culture turbidity was measured spectrophotometrically and a viable cell count was taken. These measurements indicated that the three lead salts in concentrations approaching the solubility limits had no appreciable effect on overall growth rates and cell viability. Cellular subfractions were analyzed for lead by dissolution in concentrated nitric acid followed by atomic absorption spectrometric analysis. It was concluded from this study that these microbial systems are capable of immobilizing large quantities of inorganic lead and that the lead is largely associated with cell membranes (99.3 and 99.1 percent, respectively, for Micrococcus luteus and Azotobacter sp.). The remaining lead is associated with cytoplasmic fractions. (Mortland-Battelle)
W72-14291

EVIDENCE FOR THE RECOVERY OF THE WATERS OFF THE EAST COAST OF NOVA SCOTIA FROM THE EFFECTS OF A MAJOR OIL SPILL,
Bedord Inst., Dartmouth (Nova Scotia). Atlantic Oceanography Lab.
E. M. Levy.
Water, Air, and Soil Pollution, Vol 1, No 2, p 144-148, April 1972. 1 fig, 3 tab, 5 ref.

Descriptors: *Sea water, Water pollution effects, Oil spills, Separation techniques, Fluorometry, Sampling, Water pollution sources, Solvent extractions, Persistence, Oil pollution, Biodegradation, Environmental effects, Path of pollutants.
Identifiers: *Fate of pollutants, *Bunker C oil, *Recovery, *Nova Scotia, Oil residues, Membrane filters, Membrane filtration, Sample preparation, Fuel oil, Chedabucto Bay, Particulate matter, Petroleum products.

The amount of oil residues in Chedabucto Bay, Nova Scotia and the surrounding areas was determined in order to evaluate environmental recovery from the effects of the one-year old Bunker C fuel oil spill from the tanker ARROW which was wrecked in 1970. The area examined for oil was extended beyond that of a previous investigation. Analysis for particulate oil involved filtering sea water through 0.45-micron pretreated Millipore filters. The filtrate was extracted with chloroform and examined fluorometrically. The results showed residual oil in the Halifax section decreased over an 8 month period from 6.0 - 1.9 micrograms/l at a depth of 2 m, and from 6.5 - 1.6 micrograms/l at 10 m. Variations in data collected at different metering stations were attributed to weather, biodegradation, water movements, and other environmental factors. (Long-Battelle)
W72-14292

RESEARCH ON AND CULTURE OF CALCAREOUS GREEN ALGAE,
Ohio State Univ. Research Foundation, Columbus.
L. Hillis-Colinvaux.
Final Report, February 11, 1972. 30 p, 1 fig, 3 tab, 27 ref.

Descriptors: *Cultures, *Plant growth, *Chlorophyta, *Marine algae, *Bioassay, Reproduction, Sea water, Marine plants, Primary productivity, Coral, Reefs, Antibiotics (Pesticides), Chlorinated hydrocarbon pesticides, Pesticide toxicity, Plant populations, Aquaria, Laboratory equipment, Plant physiology.
Identifiers: Epiphytes, Culturing vessels, Penicillin, Lindane, Diadema antillarum, Aandomene, Siphonales, *Halimeda spp., Penicillus capitatus, Penicillus dumentosus, Rhipocephalus phoenix, Udotea flabellum, Bryopsis, Caulerpa, Acropora palmata, Penicillus lamourouxii.

Four genera of coral reef Siphonales, Halimeda, Penicillus, Rhipocephalus and Udotea were grown in laboratory aquaria under light intensities of 650, 200-375 and 125-200 ft-candles. The commercial preparation 'Instant Ocean' was tested for use with plants. Penicillin and lindane were tested for their effect on epiphytes and other nuisances. A 15 ppm solution of the invertebrate killer Lindane did not kill Halimedae which were immersed in it for 15 minutes. Penicillin at a concentration of 3000 units per ml was initially effective in controlling the weeds, but within 2 months they were abundant again and penicillin was thereafter ineffective. The growth and development of all 4 genera from tiny protuberances above the sand to white, dying and disintegrating individuals was followed. All produced new individuals from rhizoidal-like filaments that extended outwards through the sand from the holdfast of an older plant. It was demonstrated that vegetative reproduction might occur with partial burying of individuals by shifting sands in a reef, or from portions of plants broken off by grazing or other natural activities. Plants produced vegetatively are not initially epiphytized and so may be a source of clean plants for laboratory experiment. The first swarmer-producing Penicillus plants so far known were produced during this study. The rather undistinguished structures associated with them, the release of swarmers from Halimeda, and associated observations are described. Insight into the role of calcareous plants in a reef was obtained by a productivity study which combined a census of such plants in a reef and a laboratory measure of oxygen changes in an entire aquarium. Some Halimeda reef populations appeared to be grazed by the urchin Diadema. A conservative figure for the productivity of laboratory Halimeda plants is 2.5 mg C/plant/day (net) or 4.5 mg C/plant/day (gross). (Long-Battelle)
W72-14294

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES. A SURVEY OF THE LEAD CONTENT OF FISH FROM 49 NEW YORK STATE WATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
I. S. Pakkala, M. N. White, G. E. Burdick, E. J. Harris, and D. J. Lisk.
Pesticides Monitoring Journal, Vol. 5, No. 4, p 348-355, March 1972. 1 fig, 4 tab, 23 ref.

Descriptors: *Estuaries, *Lead, Wildlife, Water pollution effects, Pollutant identification, Heavy metals, Freshwater fish, Bioassay, Chemical analysis, Colorimetry, Striped bass, Walleye, Yellow perch, Pikes, Suckers, Lake trout, Rock bass, Bullheads, Catfishes, Brown trout, Rainbow trout, Drums, *New York, Data collections, Sampling, Toxicity, Sunfishes, Carp, Analytical techniques.
Identifiers: Bioaccumulation, Sample preparation, Sensitivity, *Cayuga Lake (NY), Ictalurus, Acipenser, Perca, Dry ashing, Goldfish, Coho salmon, Burbot, Gizzard shad, Sturgeon, Pomoxis nigromaculatus, Amia calva, Salvelinus fontinalis, Salmo trutta, Lota lota, Cyprinus carpio, Esox niger, Coregonus artedii, Oncorhynchus kisutch, Aplodinotus grunniens, Dorosoma cepedianum, Carassius auratus, Salvelinus namaycush, Coregonus clupeaformis, Micropterus salmoides, Esox masquinongy, Esox lucius, Salmo gairdneri, Amblopites rupestris, Micropterus dolomieui, Morone saxatilis, Stizonstedion vitreum vitreum, Roccus chrysops, Catostomus commersoni.

A survey was made of 419 fish in 49 New York State waters for total lead content and compared to data presented on a series of lake trout sampled in 1970 from Cayuga Lake in order to determine if lead were cumulative in these fish. Lead content was determined by dry ashing 10 gm of fish at 485 degrees C and examining the residue by a colorimetric procedure. The results showed that lead concentrations usually ranged from 0.3 to 1.5 ppm, and a few samples up to 3.0 ppm. Variations were found in lead content of fish taken from different lakes, but no correlation was observed between lead concentration and size, species, or sex. Lead did not appear to be cumulative in lake trout up to 12 years of age taken from Cayuga Lake. (Long-Battelle)
W72-14298

ANIMAL TOXICITY OF PHYTOPATHOGENIC FUNGI,
North Carolina State Univ., Raleigh. Dept. of Plant Pathology.
C. E. Main, and P. B. Hamilton.
Applied Microbiology, Vol 23, No 1, p 193-195, January 1972. 1 tab, 14 ref.

Descriptors: *Plant pathology, *Toxicity, *Pathogenic fungi, *Bioassay, *Animal pathology, Phytotoxicity, Cultures, Methodology, Data collections, Pollutant identification, Pollutants, Chlorella, Inhibition, Growth, Aquatic fungi.
Identifiers: *Chlorella pyrenoidosa, Alternaria citri, Alternaria solani, Alternaria tenuis, Ceratocystis fagacearum, Ceratocystis fimbriata, Ceratocystis ulmi, Endothia parasitica, Fusarium lateritium, Fusarium oxysporum f conglutinans, Fusarium oxysporum f lycopersici, Fusarium oxysporum f niveum, Fusarium roseum f cerealis, Fusarium tricinctum Helminthosporium sativum, Helminthosporium victoriae, Nectria cinnabarina, Penicellium funiculosum, Penicillium janthinellum, Periconia circinata, Phytophthora infestans, Phytophthora parasitica var nicotiana, Rhizoctonia solani, Rhizoctonia leguminicola, Sclerotinia homeocarpa, Sclerotinia sclerotiorum, Stereum purpureum.

Twelve genera of phytopathogenic fungi comprising 27 species previously reported to produce phytotoxins were tested concurrently for animal and plant toxicity. The animal toxin bioassay involved homogenizing the mycelium and filtrate of each fungus and injecting the brew into mice. The mice were observed for 72 hours and mortality was recorded. The plant toxin bioassay involved measuring the growth inhibition of Chlorella pyrenoidosa by these fungi. The effect of media and cultural conditions on toxin production was investigated. All test fungi were grown in Main's medium enriched with Phytone which presented a common source of plant protein. The cultures were incubated at 25 C in still culture for 3 weeks, and bioassays were performed. A. tenuis (M-l) and Fusarium tricinctum gave positive mouse toxicity but lost their phytotoxic potential. Rhizoctonia solani gave a positive mouse assay, whereas the Chlorella assay was negative. Results with the other fungi were unchanged. There appeared to be no direct relationship between the phytotoxic and animal toxic potential of phytopathogenic fungi as a group. (Long-Battelle)
W72-14299

REDUCTION OF THE 20-CARBONYL GROUP OF C-21 STEROIDS BY SPORES OF FUSARIUM SOLANI AND OTHER MICROORGANISMS. I. SIDE-CHAIN DEGRADATION, EPOXIDE CLEAVAGE, AND SUBSTRATE SPECIFICITY,
Montreal Univ. (Quebec). Faculte de Pharmacie.
R. Plourde, O. M. El-Tayeb, and H. Hafez-Zedan.
Applied Microbiology, Vol 23, No 3, p 601-612, March 1972. 9 fig, 2 tab, 34 ref.

Descriptors: *Spores, *Microorganisms, *Reduction (Chemical), *Organic compounds, Fungi, Enzymes, Cultures, Spectrophotometry, Spectroscopy, Bacteria.
Identifiers: *Carbonyls, *Steroids, Characterization, Fate of pollutants, Substrate utilization, Fusarium solani, Cylindrocarpon radicicola, Septomyxa affinis, Bacillus sphaericus, Bacillus lentus, Thin-layer chromatography, 20 alpha-Hydroxy-16 alpha 17 alpha-oxidopregn-4-en-3-one, 20 alpha-Hydroxy-16 alpha 17 apha-oxidopregna-1 4-dien-3-one, 16 alpha-Hydroxy-17a-oxa-androsta-1 4-diene-3 17-dione, 16 alpha 17 beta-Dihydroxy-androsta-1, 4-dien-3-one, 17 alpha-Hydroxy-pregna-1 4-diene-3 20-dione, Androsta-1 4-diene-3 17-dione, 17a-Oxa-androsta-1 4-diene-3 17-dione, Infrared spectroscopy, Ultraviolet spectrophotometry, Ultraviolet absorption , Infrared spectra.

A comparative study of the activities of nongerminating spores and growing cells of Fusarium solani and other microorganisms on different steroids was made to determine the role of 20-reductase in microbial side-chain degradation and the side-chain removal of 16 alpha, 17 alpha-epoxysteroids. The spores of Fusarium solani reduced the C20-carbonyl group, 1-dehydrogenated ring 'A' and cleaved the side chain of 16 alpha, 17 alpha-oxidopregn-4-ene-3,20-dione (16 alpha, 17 alpha-oxidoprogesterone) (I) to give the following products: 20 alpha-hydroxy-16 alpha, 17 alpha-oxidopregn-4-en3-one (II); 20 alpha-hydroxy-16 alpha, 17 alpha-oxidopregna-1,4-dien-3-one (III); 16 alpha-hydroxy-17a-oxa-androsta-1, 4-diene-3, 17-dione (16 alpha-hydroxy-1-dehydrotestololactone) (IV); and 16 alpha, 17 beta-dihydroxy-androsta-1,4-dien-3-one (16 alpha-hydroxy-1-dehydrotestosterone) (V). The 20-reductase system of F. solani, Cylindrocarpon radicicola, Septomyxa affinis, Bacillus lentus, and three strains of B. sphaericus is active only on steriods having the 16 alpha, 17 alpha-oxido, and 4-delta-3-keto functions. Evidence of competition between side-chain degrading enzymes and the 20-reductase for the steriod molecule and evidence of side-chain degradation followed by epoxide cleavage (and not the reverse) are presented. A mechanism for the epoxide opening by nongerminating spores of F. solani is postulated. (Long-Battelle)
W72-14300

HEAVY METALS POLLUTE NATURE, MAY REDUCE PRODUCTIVITY,
Lund Univ. (Sweden). Dept. of Ecological Botany.
G. Tyler.
AMBIO, Vol. 1, No. 2, p 52-59, April 1972. 8 fig, 1 tab, 11 ref.

Descriptors: *Terrestrial habitats, *Heavy metals, *Productivity, *Ecosystems, Potassium, Magnesium, Sodium, Calcium, Hydrogen, Chemical wastes, Lead, Nickel, Toxicity, Bioindicators, Biodegradation, Biomass, Lichens, Mosses, Fungi, Algae, Soil contamination, Trace elements, Ion exchange, Pollutant identification, Copper, Cadmium, Chromium, Nickel, Manganese, Iron, Zinc, Organic compounds, Adsorption.
Identifiers: Vanadium, Bryophytes, Bioaccumulation, Metal complexes, Picea abies, Vaccinium vitis idaea, Vaccinium myrtillus, Deschampsia flexuosa, Parmelia physodes, Hypnum cupressiforme.

The deposition, accumulation, and possible effects of Pb, Cd, Cu, Zn, Ni, Fe, and Mn on terrestrial sites in Scandinavia are discussed. Bryophytes have been cited as the most sensitive biological instruments for measuring the deposition of heavy metals. Additional work has shown dead organic matter, litter, and humus that was derived from mosses and lichens to have a large capacity for capturing heavy metals through passive ion exchange. The great capacity of bryophytes and to a lesser extent, lichens, to capture heavy metals through ion exchange, is attributable to the great stability of the chemical complexes formed between heavy metal ions and negatively charged organic groups. Accumulation in mosses, lichens, and in litter and humus layers of natural and semi-natural ecosystems was found to be governed by ion exchange equilibria dependent on the absorption complex between ions from precipitation, foliage leaching, and the dry deposition present in the water passing through these components. Increasing deposition of heavy metals due to human activity adversely affects biodecomposition rates, affecting a decrease in productivity. (Byrd-Battelle)
W72-14303

TRACE ELEMENTS FOR GROWTH AND BULBIFORMIN PRODUCTION BY BACILLUS SUBTILIS,
Bihar Agricultural Coll., Sabaur (India). Div. of Mycology and Plant Pathology.
M. Mahmood.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 1-5, March 1972. 3 fig, 1 tab, 13 ref.

Descriptors: *Trace elements, *Antibiotics (Pesticides), Water pollution effects, *Nutrient requirements, *Growth, Manganese, Copper, Iron, Molybdenum, Zinc, Bioassay, Cultures, Fungi, Iron, Cobalt, Boron, Heavy metals, Inorganic compounds, *Aerobic bacteria.
Identifiers: *Bacillus subtilis, Bulbiformin, Alternaria tenuis.

The effects of trace elements on the growth and antibiobtic (bulbiformin) production of Bacillus subtilis were determined using cells, grown on basal medium containing dextrose as a carbon source. They were exposed to various amounts of boron, copper, iron, molybdenum, and zinc or combinations of these. The elements Mn and Fe, both alone and together, had a marked effect on growth and bulbiformin production by Bacillus subtilis. Copper, with Fe and/or Mn had a deleterious effect on antibiotic production, whereas Cu plus Zn as well as Mo plus B slightly increased the antibiotic produced over that obtained with Fe plus Mn. The optimum requirement of Fe was 20 p/m for both growth and antibiotic activity. The requirement of Mn for maximum growth was higher (2 p/m) than that for antibiotic activity (1 p/m). (Long-Battelle)
W72-14312

RELATIONSHIPS OF CHLOROPHYLL MAXIMA TO DENSITY STRUCTURE IN THE ATLANTIC OCEAN AND GULF OF MEXICO,
Victoria Univ. (British Columbia).
L. A. Hobson, and C. J. Lorenzen.
Deep-Sea Research, Vol. 19, No. 4, p 297-306, April 1972. 7 fig, 2 tab, 19 ref.

Descriptors: *Chlorophyll, *Spatial distribution, *Density, *Depth, Marine animals, Marine algae, Cyanophyta, Pyrrophyta, Larvae, Sampling, Invertebrates, *Atlantic Ocean, *Gulf of Mexico, Phytoplankton, Cytological studies, Systematics, Biomass, Fluorometry, Microscopy, Zooplankton, Nutrients, Photosynthesis, Standing crop, Ecological distribution, Dinoflagellates, Equipment, Light penetration, Nitrogen, Salinity, Ammonia, Nitrates, Nitrites, Copepods, Sedimentation, Carbon, Protozoa, Radiation, Enzymes, Aquatic life.
Identifiers: *Pycnocline, Chlorophyll a, Pheophytin, Tunicates, Foraminifera, Radiolaria, Trichodesmium, Flagellates, Ciliates, Nauplii, Copepodids.

Spatial distribution of chlorophyll maxima in relation to the depths of pycnoclines were studied in the Atlantic Ocean and in the Gulf of Mexico. The distribution of dissolved inorganic nitrogen and biomass of microorganisms and their taxonomic composition in chlorophyll maxima and surrounding water of the Gulf of Mexico also were examined. Water samples were taken from stations along the southwest coast of Africa, the northeastern U. S. coast, and the Gulf of Mexico at depths to 200 m using Niskin 5-liter non-metallic sampling bottles equipped with reversing thermometers. Salinity measurements were taken with a Hytech model 6210 laboratory salinometer. The start of the pycnocline was determined by the depth at which the stability of the water column exceeded .0001/dz. Standard methods were used to determine ammonia, nitrate, and nitrite and a fluorometric technique was used to measure chlorophyll a. Microorganisms were counted by microscopic techniques and cell volumes were calculated using formulas of geometrical solids that approximated cell shapes. Conversion factors reported earlier were used to convert these volumes to carbon. The spatial distributions of chlorophyll maxima were patchy and the maximum depths to which they follow pycnoclines were variable. This variability apparently relates to light adaptation by phytoplankton cells which may be a function of the taxonomic composition of the phytoplankton crop. (Mortland-Battelle)
W72-14313

ON PRODUCTIVITY ESTIMATIONS OF RIVER WATER SAMPLES BY MEANS OF ALGAE TEST PROCEDURES,
Jena Univ. (East Germany). Biology Section.
W. Braune.
Internationale Revue der Gesamten Hydrobiologie, Vol. 56, No. 5, p 795-810, 1971. 4 fig, 2 tab, 30 ref.

Descriptors: *Primary productivity, Bacteria, Scenedesmus, Growth rates, Cultures, Aquatic productivity, Metabolism, Electrodes, Electrochemistry, Photosynthesis, Rivers, Plant physiology, Testing procedures, Aquatic algae, Chlorophyta, Laboratory tests, Oxygen, Water pollution effects.
Identifiers: Saale River, Germany, Scenedesmus obliquus.

The possible influence of bacteria on the results of long-term algae test procedures (cultivating of algae in isolated unsterile water samples) was investigated and differences in the growth rates between nonaxenic and axenic Scenedesmus cultures were observed, showing differences dependent on experimental conditions. The necessity of a long experimental time in such test methods proved to be disadvantageous because there was always the possibility that in the unsterile water

sample secondary alterations (caused by bacteria) may occur, the action of which is hard to estimate under test conditions. To diminish these disadvantages a physiological test procedure was tried out. Compared to methods used till now the new method allowed short-term estimations (in a few hours) of the productivity of algae (unialgal and mixed material) in water samples by continuously recording the 02-metabolism (electrochemical 02-determination by means of membrane covered Pt-electrodes). In water samples taken from a point below the town of Jena in the river Saale there were regularly higher rates of net-photosynthesis than in samples taken from above the town (test organism: Scenedesmus obliquus). The results agreed with findings obtained by other in vitro-methods and are in contradiction to testing results in situ. (In German) (Mortland-Battelle)
W72-14314

THE EFFECT OF CHLOROFORM, PHENOLS, ALCOHOLS AND CYANOGEN IODIDE ON THE SWELLING OF PSEUDOMONAS AERUGINOSA IN VARIOUS SALTS,
Duke Univ. Medical Center, Durham, N.C. Dept. of Physiology and Pharmacology.
F. Bernheim.
Microbios, Vol. 5, No. 18, p 143-149, March-April 1972. 3 fig, 1 tab, 6 ref.

Descriptors: *Organic compounds, *Salts, *Membrane processes, *Phenols, Alcohols, Ions, Osmosis, Water pollution effects, Environmental effects, Pseudomonas, Phosphates, Sulfates, Chlorides, Antibiotics (Pesticides), Calcium, Cultures, Physical properties, Spectrophotometry, Turbidity.
Identifiers: *Pseudomonas aeruginosa, *Chloroform, *Cyanogen iodide, Synergistic effects, Organic solvents, Spermidine, Characterization, Spermine, p-Chlorophenol, Cyclohexanol, Cyclohexanone, Propanol, 2-propanol, Butanol, Cyclobutanol, Ninhydrin.

The effect of drugs and other agents on the osmotic swelling and shrinking of Pseudomonas aeruginosa in various salts was investigated using acetone, butanol, chloroform, cyclobutanol, cyclohexanol, cyclohexanone, cyanogen iodide, ninhydrin, phenol, propanol, and 2-propanol. Cell suspensions of P. aeruginosa, containing one of these agents, were incubated in sodium chloride, phosphate or sulphate and the resultant change in optical density was measured spectrophotometrically (500 millimicrons). The cells decreased less in size in sodium phosphate at pH 6.8 than in sodium chloride or sodium sulfate. The ratio of change in optical density for cells incubated in chloride or phosphate was 1 to 23, respectively. The effect of various agents and drugs on cells incubated in salt was to alter membrane permeability to the osmotic reagent resulting in swelling. Addition of chloroform, acetone, or phenols to the cells in sodium chloride or phosphate increases transport of both chloride and phosphate so there is little change in the 1:23 ratio. Cyanogen iodide and ninhydrin react with membrane sulfhydryl groups thereby increasing chloride uptake, and aliphatic alcohols increase phosphate uptake. Spermidine was antagonistic to the effects of these agents but it has a synergistic effect as well. (Long-Battelle)
W72-14315

PRODUCTIVITY OF THE BENTHIC MICROFLORA OF SHOAL ESTUARINE ENVIRONMENTS IN SOUTHERN NEW ENGLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
N. Marshall, C. A. Oviatt, and D. M. Skauen.
Internationale Revue der Gesamten Hydrobiologie, Vol. 56, No. 6, p 947-956, 1971. 4 fig, 1 tab, 13 ref.

Descriptors: *Estuarine environment, *Primary productivity, *Shoals, *Benthic flora, Sea water, Sediments, Light intensity, Diatoms, Carbon radioisotopes, New England, Aquatic life, Aquatic microorganisms, Marine algae, Salinity, Migration, Tides, Low water mark, Chrysophyta.
Identifiers: *C-14 productivity, Liquid scintillation, Sample preparation, Zostrea, Ulva.

Carbon-14 productivity by benthic microflora from shoal estuarine environments in southern New England was measured by a C-14 uptake method. Representative and intact sediment samples were collected and the C-14 counted by liquid scintillation after being passed through a pulverized filter and suspended in Cab-O-Sil. Productivity was measured by calculating the difference in C-14 uptake measured between light and dark flasks. Sediment variability caused extremely high deviations in productivity values, probably as a result of irregular microflora distribution. Results obtained with the Cab-O-Sil suspension processing technique when compared with the wet oxidation method proved to be achieved more easily, directly, and consistently; however, similar results were obtained from both methods. The average yearly C-14 productivity of all sampled estuarine shoals equalled 20.1 mg/sq m/hr with high peaks of productivity occurring in the warmer months. The limited tests for light effects seemed to indicate that the strongest mid-summer light peaks are in excess of the optimum and that an upward migration of diatoms at low tide may result in increased productivity. (Byrd-Battelle)
W72-14317

EFFECTS OF THE OIL INDUSTRY ON SHORE LIFE IN ESTUARIES,
University Coll. of Swansea (Wales). Dept. of Zoology.
A. Nelson-Smith.
Proceedings of the Royal Society of London, Series B, Vol. 180, No. 1061, p 487-496, March 21, 1972. 4 fig, 14 ref.

Descriptors: *Oil industry, *Estuaries, *Aquatic life, *Oil pollution, Water pollution, Oil wastes, *Oil spills, Oily water, Water pollution effects, *Toxicity, Salt marshes, Organic matter, Mollusks, Phaeophyta, Rhodophyta, Aromatic compounds, Bioassay, Mud, Sands, Marsh plants, Emulsifiers, Gastropods, Shores.
Identifiers: Crude oil, Petroleum products, Lichens, Fuel oil, Ramalina spp, Spartina, Pelvetia canaliculata, Fucus spiralis, Fucus serratus, Gigartina stellata, Verrucaria mucosa, Gelliswick Bay, Littorina neritoides, Chthamalus stellatus, Patella vulgata, Monodonta lineata, Littorina saxatilis neglecta.

The effects of oil pollution on shore life in estuaries depend partly on the nature of the oil and partly on the means by which it reaches the shore. Crude petroleum and products refined from it may be spilt at any point from well up river to far out at sea. Crude oils are moderately toxic; some products may be very harmful, but heavy fuel oils are almost inert. Toxic fractions are removed by weathering, but oils split around tanker-terminals in estuaries reach the shore very soon after release. In Milford Haven, spillages average some 50 tons per year, about 0.0001 percent of the volume handled. Oil which has not been emulsified rarely penetrates mud or sand but is trapped on salt-marsh vegetation; annuals and shrubby perennials are badly affected, although other perennials recover well. On rocky shores, grazing molluscs may be killed, especially if aromatic-based emulsifiers are used to remove the oil. This permits the widespread growth of seaweeds, with repercussions on other shore life. Repeated spills may gradually eliminate some gastropods. Chronic pollution by oil in low concentrations can gravely damage salt-marsh and produces detectable effects on rocky shores. Speed is essential in dealing with a spillage; the most effective treatment is dispersal with emulsifiers and this is best done before the slick becomes stranded. Oiled shores should be left alone wherever possible; mechanical removal is preferable to spraying. (Byrd-Battelle)
W72-14318

THE ECOLOGY OF SOME BRITISH RIVERS IN RELATION TO WARM WATER DISCHARGES FROM POWER STATIONS,
Central Electricity Generating Board, Ratcliffe-on-Soar (England). Freshwater Biology Unit.
T. E. Langford, and R. J. Aston.
Proceedings of the Royal Society of London, Series B, Vol. 180, No. 1061, p 407-419, March 21, 1972. 16 fig, 14 ref.

Descriptors: *Ecology, *Water pollution effects, *Thermal pollution, *Rivers, *Powerplants, *Discharge (Water), *Biological communities, Environmental effects, Water temperature, Aquatic life, Freshwater, Aquatic microorganisms, Aquatic animals, Fish, Invertebrates, Sampling, Measurement, On-site tests, Wildlife, Oligochaetes, Annelids, Aquatic insects, Mayflies, Caddisflies, Midges, Diptera, Amphipoda, Crustaceans.
Identifiers: Macroinvertebrates, Species diversity, *River Severn, *River Trent, Chironomids, England, Limnodrilus hoffmeisteri, Tubifex tubilex, Nymphs, Characterization, Ephemerella ignita, Taeniopteryx nebulosa, Heptagenia sulphurea, Psychomia pusilla, Emergence.

The effects of powerplant warm water discharges on the local aquatic life in the English Rivers Severn and Trent were used as an indicator of the effects of thermal pollution on the environment. Various sampling stations were placed downstream from the powerplant outflow to measure temperature fluctuations and to observe local aquatic life. In the Severn River temperatures up to 28 degrees C below the outfalls had no effect on the invertebrate fauna. There were slight alterations in the hatching of insect nymphs which may have been attributable to temperature, though natural variations from year to year were much more obvious. Emergence of adult Ephemeroptera and Trichoptera was not affected by temperatures of 26 to 28 degrees C. The River Trent is used for cooling by some 14 power stations. There were no obvious changes in the diversity of the invertebrate fauna which could be related to temperature, though pollution from other sources caused very marked changes. However, at Drakelow power plant, the most polluted reach changes were observed in the oligochaete community, and experiments showed that Limnodrilus haffmeisteri had a wider temperature distribution range for reproduction than Tubifex tubifex. Fish populations were shown to withstand quite sudden and wide temperature fluctuations. (Long-Battelle)
W72-14319

THE EFFECTS OF PESTICIDES ON LIFE IN FRESH WATERS,
Freshwater Fisheries Lab., Pitlochry (Scotland).
A. V. Holden.
Proceedings of the Royal Society of London, Series B, Vol. 180, No. 1061, p 383-394, March 21, 1972. 1 tab, 23 ref.

Descriptors: *Pesticides, Water pollution effects, *Aquatic life, *Pesticide toxicity, Invertebrates, Mortality, Fry, Organophosphorus pesticides, Freshwater fish, Chlorinated hydrocarbon pesticides, Bioassay, Resistance, Pesticide kinetics, Crustaceans, Aquatic populations, Pesticide residues, Environmental effects, Trout, Perch, Pikes, Aldrin, Dieldrin, 2 4 D, DDT, Dalapon, Diazinon, Diquat, DDE, Endrin, Daphnia, Sunfishes, Lethal limit, Mercury.
Identifiers: Metabolites, 2 4-D amine, Maleic hydrazide, Simazine, Dichlobenil, BHC, TDE, MCPA, MCPB, Dichlorprop, Dichloflaunid, Fen-

tin hydroxide, Thiram, Captan, Dinocap, Mercabam, Chara, Diuron, Vertebrates, Tissue, Gammarus fasciatus, Daphnia magna, Gamma BHC, Carbophenothion, Simocephalus serrulatus, Dichloronaphthaquinone, Electron capture gas chromatography, Demeton, Malathion, DNBP, Mecoprop, p p' DDT, p p' TDE, p p' DDE.

About sixty pesticides are estimated to be used in Britain in circumstances where some contamination of fresh waters could occur. Apart from major fish kills, most of the evidence of contamination must be obtained from chemical analyses of water or fish, although these are mainly restricted to a few organochlorine and organophosphorus compounds. The potential hazards to fish and invertebrates have been identified in laboratory experiments and toxicity tests, but routine population surveys of susceptible species in rivers and lakes are rarely made. The nature of possible environmental effects of various types of pesticides is described, and the information on toxic levels of some chemicals, obtained from laboratory tests, is compared with the limited data available on levels existing in the environment. The need for more extensive screening of pesticide chemicals, especially the more persistent types, is discussed. Both adult fish and fry of several species should be used in tests, as well as representative invertebrates, which are known to be more susceptible to some pesticides than are fish. Long-period tests are also required, as for some pesticides the lethal concentrations are much lower in extended tests than in the usual short-period tests. Where possible, the test species, whether fish or invertebrates, should be analyzed for the chemical under test. Analytical techniques should be developed, for levels existing in the environment, of a wider range of compounds than is currently investigated. (Long-Battelle)
W72-14320

PHYSIOLOGICAL AND MORPHOLOGICAL EFFECTS OF PHENETHYL ALCOHOL UPON A GRAM-NEGATIVE MARINE PSEUDOMONAD,
Macdonald Coll., Sainte Anne de Bellevue (Quebec). Dept. of Microbiology.
J. Thompson, and I. W. DeVoe.
Canadian Journal of Microbiology, Vol 18, No 6, p 841-852, June 1972. 10 fig, 1 tab, 29 ref.

Descriptors: *Pseudomonas, *Marine bacteria, Water pollution effects, Organic compounds, Marine microorganisms, Growth rates, Absorption, Electron microscopy, Physical properties, Radiochemical analysis, Carbon radioisotopes, Bioindicators, Sodium, Potassium, Inhibition, Membrane processes, Amino acids, Aerobic bacteria.
Identifiers: *Phenethyl alcohol, *Waste characterization, Alpha-aminoisobutyric acid, C-14, Freeze etching technique, Pseudomonads, Bacterial physiology.

The effects of phenethyl alcohol (PEA) upon a gram-negative marine pseudomonad were studied in order to determine the primary target of PEA at the cellular level. Phase contrast and electron microscopic and freeze-etching techniques were used to examine the morphological and physiological changes caused by PEA. Sodium and potassium as well as C-14 alpha-aminoisobutyric acid (AIB) were used as indicators of PEA-induced changes in membrane permeabilities. PEA (0.15 percent v/v) inhibited the organisms growth; however, after removal of PEA the cells remained viable even when pre-exposed to PEA concentrations as high as 0.25 percent (v/v). PEA concentrations of 0.25 percent or less inhibited AIB uptake unless potassium was added to the uptake system. Both AIB and potassium were lost from preloaded cells after addition of PEA. It seems likely that the inhibition of cell growth by PEA is due to two major causes: (1) direct interference of the compound with the normal physiological functions of the cytoplasmic membrane and, (2) PEA induced structural changes occurring within the cell envelope. (Long-Battelle)
W72-14323

A STUDY OF THERMOPHILIC AEROBIC SPOREFORMING BACTERIA ISOLATED FROM SOIL AND WATER,
Missouri Univ., Columbia. Dept. of Food Science and Nutrition.
O. Harris, and M. L. Fields.
Canadian Journal of Microbiology, Vol 18, No 6, p 917-923, June 1972. 5 tab, 9 ref.

Descriptors: *Aerobic bacteria, *Thermophilic bacteria, Spores, Hydrogen ion concentration, Cultures, Water pollution sources, Pollutant identification, Temperature, Soil bacteria, Aquatic bacteria, Laboratory tests, Growth.
Identifiers: *Waste characterization, Guanine, Cytosine, DNA, Bacillus stearothermophilus, Bacillus coagulans, Biochemical tests, Standard methods, Substrate utilization, Culture media.

Thirty-three strains of thermophilic, aerobic, spore-forming bacteria isolated from soil and water were studied by classical bacteriological methods and by the percent guanine plus cytosine (percent GC) in their DNA. For temperature studies all organisms were grown at 55 degrees; to determine maximum growth temperatures tests were run at 55C and at 5 degree intervals until no growth occurred. Percent GC was determined by a previously described method. The cultures fell into two groups based upon percent GC. There were 12 strains with percent GC of 52-53.1 which were characteristic of Bacillus stearothermophilus. These strains were also classifiable as B. stearothermophilus by classical determinative bacteriological methods except three were aciduric. The other 21 strains had percent GC ranging from 38.8 to 43.9 with a mean percent GC of 42.04. Ten strains of the 21 could be B. coagulans by classical determinative bacteriological methods but not by percent GC. The other 11 strains were not determinable by current classical determinative keys. These strains may be thermophilic variants of mesophilic species. (Long-Battelle)
W72-14324

DISTRIBUTION OF CLOSTRIDIUM BOTULINUM TYPE E IN THE GULF OF ST. LAWRENCE IN RELATION TO THE PHYSICAL ENVIRONMENT,
Fisheries Research Board of Canada, Halifax (nova Scotia). Halifax Lab.
R. A. Laycock, and D. H. Loring.
Canadian Journal of Microbiology, Vol 18, No 6, p 763-773, June 1972. 3 fig, 28 ref.

Descriptors: *Sediments, *Sea water, *Distribution patterns, *Ecological distribution, Clostridium, Cultures, Sampling, Rivers, Marine bacteria, Geographical regions, Estuaries, Water flow, Geomorphology, Toxicity, Public health, Aquatic soils, Water pollution, Pathogenic bacteria, St. Lawrence River.
Identifiers: *Clostridium botulinum, Biochemical tests, *Gulf of St. Lawrence.

Three hundred ninety sediment samples were collected June-September 1970 from the Gulf of St. Lawrence and the lower reaches of the St. Lawrence River in order to determine the distribution of Clostridium botulinum type E. The samples were collected with gravity corers and a pipe dredge, placed in sterile polyethylene bags and refrigerated until analysis. About 10 g of sediment was inoculated into a supplemented (glucose, peptone, trypticase, yeast extract) cooked meat medium in 60 cu cm bottles and incubated at 25 degrees C for 5 days in a 95 percent nitrogen, 5 percent carbon-dioxide atmosphere. Subsamples of incubated medium were centrifuged and the presence of toxic material detected by mouse intraperitoneal injection of 0.5 ml of supernate diluted 4:1 with gelatin-phosphate buffer. Samples, lethal to mice within 48 h, were further tested for specific toxins of C. botulinum. C. botulinum was shown to be present in high incidence in some areas while it appeared to be absent from others. No other types of C. botulinum were encountered. The results indicate a close correlation between patterns of terrigenous sedimentation and of distribution of C. botulinum type E. (Long-Battelle)
W72-14325

APPARATUS FOR CONTINUOUS MEASUREMENT OF ACTIVE UPTAKE OF RADIOACTIVE SUBSTANCES,
Regensburg Univ. (West Germany).
For primary bibliographic entry see Field 05A.
W72-14326

ISOLATION AND CHARACTERIZATION OF ULTRAVIOLET LIGHT-SENSITIVE MUTANTS OF THE BLUE-GREEN ALGA ANACYSTIS NIDULANS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 05A.
W72-14327

HETEROTROPHIC NITRIFICATION BY ARTHROBACTER SP.,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
W. Verstraete, and M. Alexander.
Journal of Bacteriology, Vol 110, No 3, p 955-961, June 1972. 2 fig, 2 tab, 26 ref.

Descriptors: *Nitrification, Ammonia, Nitrites, Nitrates, Mass spectrometry, Methodology, Nutrients, Chemical reactions, Organic compounds, Ammonium compounds, Nitrogen cycle, Hydrogen ion concentration, Iron, Carbon, Nitrogen, Deficient elements, Environmental effects, Cultures, Sewage bacteria, Pollutant identification, Inhibition.
Identifiers: *Heterotrophic bacteria, *Arthrobacter, Culture media, Enrichment, Hydroxylamine, Benzophenone oxime, l-nitrosoethanol, Substrate utilization, Mass spectra, Infrared spectra.

Arthrobacter sp., isolated from sewage, oxidized ammonium to hydroxylamine, a bound hydroxylamine compound, a hydroxamic acid, a substance presumed to be a primary nitro compound, nitrite, and nitrate. The concentration of free hydroxylamine-nitrogen reached 15 micrograms/ml. The identification of hydroxylamine was verified by mass spectrometric analysis of its benzophenone oxime derivative. The bound hydroxylamine was tentatively identified as l-nitrosoethanol on the basis of its mass spectrum, chemical reactions, and infrared and ultraviolet spectra. Hydroxylamine formation by growing cells was relatively independent of pH, but the accumulation of nitrite was strongly favored in alkaline solutions. The formation of hydroxylamine but not nitrite was regulated by the carbon to nitrogen ratio of the medium. The hydroxamic acid was the dominant product of nitrification in iron-deficient media, but hydroxylamine, nitrite, and l-nitrosoethanol formation was favored in iron-rich solutions. Heterotrophic nitrification by Arthrobacter sp. was not inhibited by several compounds at concentrations which totally inhibited autotrophic nitrification. (Snyder-Battelle)
W72-14328

EFFECT OF AMINO ACIDS ON THE GROWTH OF ACETOBACTER SUBOXYDANS,
The Pennsylvania State Univ., University Park. Dept. of Microbiology.
R. T. Belly, and G. W. Claus.
Archiv fur Mikrobiologie, Vol 83, No 3, p 237-245, April 1972. 1 fig. 2 tab, 24 ref.

Descriptors: *Amino acids, *Cultures, *Nutrient requirements, *Growth, Growth rates, Ammonium compounds, Organic compounds, Nutrients, Water pollution effects, Inhibition, Microbiology, Acid bacteria.
Identifiers: *Acetobacter suboxydans, Biosynthesis, Substrate utilization, Glutamate, Glutamine, alpha-Ketoglutarate, Proline, Histidine, Glycine, Hydroxyproline, Mesaconate, Lysine, Leucine, Aspartate, Cysteine, Methionine, Phenylalanine, Arginine, Alanine, Tryptophan, Serine, Tyrosine, Threonine, Isoleucine, Valine, Culture media.

The role of amino acids in the nutrition of Acetobacter suboxydans ATCC 621 has been considered and an assessment made of the relative capacity of the organism for amino acid biosynthesis. Cells were grown on a chemically defined basal medium, to which were added amino acids. Changes in growth rates were noted and recorded graphically. A chemically defined medium containing no amino acids supported cellular growth. Growth was stimulated by the addition of either glutamate, glutamine, alpha-ketoglutarate, proline, histidine, and to a lesser extent by the addition of either glycine, hydroxyproline, or mesaconate. (Long-Battelle)
W72-14329

INTERACTIONS OF LIGHT AND INORGANIC NITROGEN IN CONTROLLING NITROGEN UPTAKE IN THE SEA,
Washington Univ., Seattle. Dept. of Oceanography.
J. J. MacIsaac, and R. C. Dugdale.
Deep-Sea Research, Vol 19, No 3, p 209-232, March 1972. 9 fig, 6 tab, 31 ref.

Descriptors: *Oceans, *Light intensity, *Photosynthesis, Limiting factors, Productivity, Sea water, Nitrogen, Nitrates, Ammonium compounds, *Phytoplankton, *Euphotic zone, *Nutrients, Nutrient removal, Kinetics, Oligotrophy, Eutrophication, Carbon, Water pollution, Profiles, Pollutant identification, Absorption.

The uptake of ammonium and nitrate in natural populations of marine phytoplankton is light dependent and often can be described adequately by the Michaelis-Menten equation. The half-saturation constant for light intensity in nitrate and ammonium uptake is found to be from 1 to 14 percent of surface light intensity, an intensity range occurring near the bottom of the euphotic zone. Since the uptake of these compounds as a function of substrate concentration is also described by the same equation, many vertical profiles of nitrate and ammonium uptake obtained with the N-15 technique can be interpreted from the interaction of light and nutrient concentration at different depths. In oligotrophic waters, nutrient uptake is severely limited by nutrient concentrations; but in eutrophic areas, light intensity very often is the limiting factor. In the former, maximal uptake may occur deep in the euphotic zone, while in the latter, the maximum occurs near the surface. Ammonium is taken up more readily than nitrate by populations in all areas, and in oligotrophic regions may account for 80 percent of the inorganic nitrogen uptake. In eutrophic areas, most of the inorganic nitrogen uptake is based on nitrate. Ratios of carbon to nitrogen taken up by phytoplankton vary over a wide range (12-76), with some indication that the lower values are associated with regions having a certain degree of environmental stability--either very rich or very poor waters. (Byrd-Battelle)
W72-14333

THE EFFECT OF COMPOUNDS CONTAINING AMINO GROUPS ON MICROBIAL GROWTH IN THE MEDIUM WITH OIL FUEL, (IN RUSSIAN),
Moscow State Univ. (USSR); and Institut Neftekhimicheskoi i Gazovoi Promyshlennost, Moscow (USSR).
T. P. Vishniakova, I. D. Vlasova, and N. N. Grechushkina.
Mikrobiologiya, Vol 41, No 1, p 73-76, January/February 1972. 1 tab, 7 ref.

Descriptors: *Cultures, *Fuels, *Growth, *Oil, Organic compounds, Pseudomonas, Methodology, Microbiology, Pollutant identification, Water pollution effects, Hydrogen ion concentration, Nitrogen compounds, Microorganisms, Environmental effects.
Identifiers: Amines, Cladosporium resinae, Pseudomonas pyocyanea, Urea, Waste characterization.

The inhibition of microbial growth by water soluble amino compounds was studied in a water-fuel system. A 100 percent inhibition of growth was found when 0.04 percent 1,2-diaminopropane or hexamethylene diamine, 0.12 percent ethylene diamine, hydroxylamine chloride or acid methylamine tartrate, 0.16 percent trimethylamine or N-butylamine was added to the water-mineral phase. A 98 percent growth inhibition was found upon addition of 0.08 percent N-butylamine, ethylene diamine, hydroxylamine chloride or methylamine oxalate and a 96 percent growth inhibition was observed with N-heptylamine. Dimethylamine, m-phenylene diamine and methylamine tartrate caused partial growth inhibition. Urea, p-amino-salicylic acide and dimethylamine chloride at concentrations of 0.04-0.16 percent did not inhibit the growth. The majority of active compounds altered the initial pH of the water phase (6.9-7.2) to the acidic (4-5) or alkaline (9-10) values. The compounds with a low inhibiting effect or manifesting no activity almost did not change pH of the water phase. (Long-Battelle)
W72-14334

THE ASSIMILATION OF MONOCARBON COMPOUNDS BY PSEUDOMONAS SP. 2,
Moscow State Univ. (USSR).
N. N. Kirikova, Yu. A. Trotzenko, and E. N. Kondratieva.
Mikrobiologiya, Vol 41, No 1, p 5-10, January-February 1972. 6 tab, 4 ref.

Descriptors: *Organic compounds, *Pseudomonas, Cultures, Growth, Enzymes, Aerobic bacteria, Oxidation, Chemical reactions, Inhibition, Antibiotics (Pesticides), Organic acids, Amino acids, Carbon, Radioactivity techniques, Carbon radioisotopes.
Identifiers: *Substrate utilization, *Assimilation, Hydrocarbons, Culture media, Waste characterization, Fate of pollutants, C-14.

The cell suspensions of Pseudomonas sp. 2, capable for the growth on media with ethanol and formiate, actively fixed C-14 from these substrates as well as C-1402. Hypophosphite and fluoroacetate inhibited the incorporation of C-14 from methanol, formaldehyde and formiate. Formaldehyde inhibited the incorporation of C-14 in the cells from methanol and formiate. Sulphanilamide inhibited the bacterial growth in the presence of methanol. When the cells were exposed to C-14-methanol for a short time, the label was detected in malic and fumaric acids, serine, glycine, aspartic and glutamic acids. Therefore, Pseudomonas sp. 2 assimilated carbon from monocarbon compounds after their oxidation to CO2 and on a higher reduced level. The second process seems to proceed with the participation of tetrahydrofolate and reactions of the tricarboxylic acid cycle. The functioning of this cycle in Pseudomonas sp. 2 is confirmed by the presence of malate dehydrogenase, isocitrate dehydrogenase, succinate dehydrogenase and alpha-ketoglutarate dehydrogenase. (In Russian) (Long-Battelle)
W72-14335

EVALUATION OF BENSULIDE FOR MUTAGENIC PROPERTIES IN MICROBIAL TEST SYSTEM,
Battelle Columbus Labs., Ohio.
K. J. Andersen, and A. J. Cutaia.
Journal of Agricultural and Food Chemistry, Vol 20, No 3, p 656-658, May/June 1972. 3 tab, 5 ref.

Descriptors: *E. coli, *Herbicides, *Bacteriophage, Evaluation, Chemical properties, Water pollution sources, Testing, Statistics, Methodology, Statistical methods, Water pollution effects.
Identifiers: *Mutagenicity, *Bensulide, 5-bromouracil, Acetone, Sodium chloride.

The frequency of mutations in the T-4 bacteriophage/ E. coli B system was measured in order to determine mutagenic properties of the herbicide, bensulide, as well as sodium chloride, acetone, and 5- bromouracil. The procedure involved subjecting the bacteriophage-E. coli system to the chemicals and statistically analyzing the frequency of rII-type mutants. The data obtained were subjected to distribution analysis using the chi-square test for Poisson distribution variables. Although acetone and bensulide caused slight increases in mutation rates over a control, there was not sufficient data to show the mutagenicity of bensulide. (Long-Battelle)
W72-14336

BENTHIC FAUNAL RECOVERY IN A SWEDISH FJORD FOLLOWING THE CLOSURE OF A SULPHITE PULP MILL,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
R. Rosenberg.
OIKOS, Vol 23, No 1, p 92-108, 1972. 18 fig, 6 tab, 29 ref.

Descriptors: *Benthic fauna, *Fjords, *Pulp wastes, *Sulfite liquors, Water pollution sources, Physiochemical properties, Water quality, Waste water (Pollution), Sediments, Cores, Sampling, Distribution patterns, Biological communities, Systematics, Water pollution effects, Annelids, Discharge (Water), Marine animals, Hydrography, Water temperature, Salinity, Dissolved oxygen, Biochemical oxygen demand, Hydrogen ion concentration, Organic matter, Trawling, Industrial wastes, Sulfides, Resins, Sodium, Calcium, Magnesium, Chloride, Sulfides, Biomass, Sieve analysis, Clams, Gastropods, Mollusks, Crustaceans.
Identifiers: *Sweden, Sample preservation, Macroinvertebrates, Sulfites, Nemerteans, Echiuroids, Phoronids, Echinoderms, Gullmarsfjord, Mercaptans, Saltkallifjord, Cerianthus lloydi, Edwardsia, Peachia hastata, Lepidonotus squamatus, Gattyana cirrosa, Polynoe kinbergi, Pholoe minuta, Anaitides groenlandica, Eteone longa, Ophiodromus flexuosus, Glycera alba, Goniada maculata, Nephtys hombergi, Nephtys incisa, Nephtys ciliata.

The recolonization of benthic fauna was studied in Saltkallefjord on the west coast of Sweden following the discontinuation of sulfite pulp manufacture at a pulp mill that discharges waste water into the fjord. Hydrographic measurements included temperature, salinity, DO, BOD, and pH. A core sampler was used to collect sediment samples, which were analyzed in 2-cm sections for organic matter and ignition loss. Benthic fauna were sampled quantitatively at 53 stations using a 0.1-sq m Smith McIntyre bottom sampler. Sieve residues restrained by a millimeter mesh was preserved in 70 percent alcohol for further laboratory analysis. The wet weight was determined after blotting on filter paper and the quantity of dry organic matter was estimated using a conversion factor obtained from earlier studies. The analyses indicated that water quality improved as a result of reduced waste water discharges. After 1968, the benthic macrofauna had colonized fjord areas that in the early 1960's were azoic or occupied by only a poor fauna. During May-October 1969 the number of species in these areas increased monthly. (Mortland-Battelle)
W72-14337

THE ECOLOGY OF MORECAMBE BAY. II. INTERTIDAL INVERTEBRATES AND FACTORS AFFECTING THEIR DISTRIBUTION,
Nature Conservancy, Norwich (England). Coastal Ecology Research Station.
S. S. Anderson.
Journal of Applied Ecology, Vol 9, No 1, p 161-178, April 1972. 8 fig, 2 tab, 27 ref.

Descriptors: *Invertebrates, *Intertidal areas, *Distribution patterns, *Estuarine environment, *Soil analysis, *Ecological distribution, Systematics, Ecology, Sands, Physiochemical properties, Sampling, Cores, Sieve analysis, Sediments, Annelids, Mollusks, Marine animals, Spatial distribution, Nematodes, Aquatic soils, Estuaries, Particle size, Nitrogen, Calcium, Spectrophotometry, Phosphorus, Colorimetry, Salinity, Isopods, Crustaceans, Seasonal, Carbon, Organic matter, Impoundments, Amphipoda, Gastropods, Clams, Worms.
Identifiers: *Morecambe Bay, Arthropods, Nemerteans, Macroinvertebrates, Barrage, Sample preservation, England, Arenicola marina, Macoma balthica, Hydrobia ulvae, Corophium volutator, Kjeldath procedure, Atomic absorption spectrophotometry, Nereis diversicolor, Nereis virens, Nepthys hombergi, Pygospio elegans, Organic nitrogen, Lanice conchilega, Cardium edule, Scrobicularia plana, Mya arenaria, Tellina tenuis, Mytilis edulis, Crepidula fornicata, Bathyporeia pilosa, Marinogammarus marinus, Crangon vulgaris, Carcinus maenas, Ligia oceanica, Polychaetes.

A series of surveys was carried out on the numbers and distribution of intertidal invertebrates in Morecambe Bay, England. The purpose was to see if environmental factors would be correlated with the abundance of species, in order to forecast any population changes of invertebrate species likely to result from barrage construction. A 1-mm mesh sieve was used in the laboratory and the animals retained were preserved in formalin, identified and counted. Physical and chemical characteristics of the sands that were considered to affect invertebrate distribution were also studied. Standard methods were used in analyzing particle size to arrive at a medium particle diameter. Ignition losses were measured in a muffle furnace at 500C for 2 hr and expressed as a percentage of dry weight, which gave a rough estimate of organic carbon. An automated colorimetric system based on the indophenol blue reaction was used to estimate organic nitrogen. Calcium was determined by atomic absorption spectrophotometry and phosphorus by colorimetry based on the phospho-molybdenum blue reaction. The high level flats above plus 6 ft O.D. consisted of fine-grained sediments which were relatively rich in organic carbon, organic nitrogen and phosphorus. A relationship between grade of deposits and quantities of carbon, nitrogen and phosphorus was demonstrated. The sandflats below plus 6 ft O.D. were characterized by coarser deposits and correspondingly lower values of carbon, nitrogen and phosphorus. High calcium values were associated with the coarsest sediments and with areas of abundant mollusc spat. One dominant species and three groups of species could be recognized on the basis of distribution and species density. (See also W72-14339) (Mortland-Battelle)
W72-14338

THE ECOLOGY OF MORECAMBE BAY. IV. INVERTEBRATE DRIFT INTO AND FROM THE RIVER LEVEN,
Freshwater Biological Association, Ambleside (England).
J. M. Elliott, and J. Corlett.
Journal of Applied Ecology, Vol 9, No 1, p 195-205, April 1972. 1 fig, 8 tab, 21 ref.

Descriptors: *Invertebrates, *Drifting (Aquatic), Sampling, Lotic environment, Zooplankton, Systematics, Larvae, Estuarine environment, Aquatic animals, On-site tests, Freshwater, Copepods, Crustaceans, Fish, Water pollution sources, Nets, Equipment, Daphnia, Plankton nets, Aquatic insects, Diptera, Isopods, Gastropods, Water beetles, Mayflies, Midges, Amphipoda, Waterfleas, Stoneflies, Caddisflies.
Identifiers: River Leven, *Morecambe Bay, Lake Windermere, Colonization, Repopulation, Arthropods, Macroinvertebrates, Diaptomus gracilis, Daphnia hyalina, Bosmina coregoni, Sida crystallina, Cyclops spp, Chaoborous spp, Leptodora kindti, Bythotrephes longimanus, Gammarus pulex, Crangonyx pseudogracilis, Asellus aquaticus, Glossiphonia complanata, Limnaea peregra, Chironomids, Bugs, Lemnephilids, Tipulids, Black flies, Nauplii, Barrage, Amphinemura sulcicollis, Nemoura cinerea, Leuctra inermis, Leuctra geniculata, Perlodes microcephala, Isoperla grammatica, Chloroperla torrentium, Ephemerella ignita, Caenis rivulorum, Baetis rhodani, Heptagenia sulphurea, Sigara dorsalis, Rhyacophila dorsalis, Agapetus fuscipes, Psychomyia pusilla, Hydropsyche instabilis, Elmis aenea, Oulimnius tuberculatus, Simulium spp, Gammarus zaddachi, Asellus aquaticus, Erpobdella octoculata, Limnaea truncatula, Lampetra planeri, Anguilla anguilla, Pleuronectes flesus, Salmo salar, Protonemura meyeri, Glossosoma boltoni, Agapetus fuscipes, Polycentropus flavomaculatus, Hydropsyche pellucidula, Cheumatopsyche lepida, Silo pallipes.

In order to assess the importance of drifting invertebrates as potential colonizers of certain freshwater areas, the qualitative and quantitative composition of invertebrate drift into (outflow of Lake Windermere) and from (Low Wood Bridge) the River Leven which flows into Morecambe Bay were studied. Drift samples were taken at two stations by a procedure that insured samples from different points across the river at different times of the day. The physical conditions were recorded for the two stations. Copepoda and Gladocera were predominant in the drift samples at the lake outflow. Although very large numbers were drifting out of the lake, no planktonic species were found in the drift samples at Low Wood Bridge. A plankton net used at Low Wood Bridge caught nauplii and viable eggs of copepods. Therefore, some planktonic species do survive the journey down the River Leven and would rapidly colonize a freshwater reservoir at the mouth of the Leven estuary. Large numbers of lotic invertebrates were taken in the drift samples at Low Wood Bridge, especially at night. These drifting invertebrates would rapidly colonize the Leven estuary if ever it became freshwater. As many species in the drift have also been found in still water, there would also be a rapid colonization of a freshwater reservoir at the mouth of the estuary. (See also W72-14338) (Long-Battelle)
W72-14339

STRATIGRAPHIC RECORD OF POLLUTION IN SHAGAWA LAKE, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
J. P. Bradbury, and R. O. Megard.
Geological Society of America Bulletin, Vol 83, No 9, p 2639-2648, September 1972. 4 fig, 3 tab, 27 ref.

Descriptors: *Water pollution effects, *Eutrophication, *Lakes, *Minnesota, *Bottom sediments, Cores, Stratigraphy, Water pollution sources, Mine wastes, Sewage, Productivity, Nutrients, Lake sediments.
Identifiers: *Shagawa Lake (Minn).

Shagawa Lake in northeastern Minnesota is an anomalously productive lake in a region dominated by many very fresh and unproductive lakes. It receives treated sewage from the town of Ely. Mine wastes once entered the lake. A 1-m core of lake sediments was studied to ascertain the prehistoric trophic status of this lake and its response to mining, lumbering, and intensive human settlement in its watershed. The core contains three distance zones. The lower zone (100 to 75 cm) is dominated by benthic and littoral diatoms and by a diverse assemblage of Cladocera. These features suggest that the littoral zone was more extensive or more productive (or both) than when the upper zones were deposited. The middle zone (75 to 25 cm) contains a planktonic diatom flora characterized by Cyclotella comta, a common form in the unpolluted lakes of this latitude. The upper zone (25 to 0 cm) contains abundant remains of Stephanodiscus minutus, Fragilaria crotonesis, and F. capucina, which are planktonic diatoms living today in the lake and in many highly enriched lakes to the south. This zone coincides with the appearance of hematite and limonite mineral grains that entered the lake when mining began in the area about 1890 and with an increase in ragweed (Ambrosia) pollen that marks land clearance and the beginning of European settlement. Shagawa Lake responded rapidly to increased nutrient levels caused by a variety of human activities in and around the lake. (Knapp-USGS)
W72-14349

EFFECTS OF A PROPOSED 35-FOOT CHANNEL TO RICHMOND ON CURRENTS AND SALINITIES OVER THE SEED OYSTER BEDS IN JAMES RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb, N. J. Brogdon, Jr., and H. B. Simmons.
Available from NTIS, Springfield, Va. 22151, as AD-735 849 Price $3.00 paper copy; 95 cents microfiche. Miscellaneous Paper No 2-912, September 1966. 24 p, 24 plate, 6 tab.

Descriptors: *Model studies, *Estuaries, *Dredging, *Environmental effects, *Virginia, Ecology, *Oysters, Salinity, Tidal effects, Currents (Water), Hydrologic data, Data collections, Forecasting, Engineering, Channel improvement, Navigation.
Identifiers: *James River estuary (Va).

A model which reproduces tides, currents, and salinities in the James River and tributaries was used to determine the probable effects of a proposed 10-ft increase in the depth (from 25 ft to 35 ft below mean low water) of the navigation channel between Newport News and Richmond. That reach of the James River is the major source of seed oysters for the 5,000,000 per annum Chesapeake Bay oyster industry. Measurements of salinities and currents were made throughout the reach at half-hourly intervals over a complete tidal cycle, and the results were averaged to determine the average salinity or average velocity values. The proposed 10-ft deepening of the navigation channel was determined to have no significant effects on tides, currents, or salinities. (Woodard-USGS)
W72-14376

ASSESSING TEMPERATURE EFFECTS WITH BIOLOGY,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Biological and Chemical Section.
K. M. MacKenthun, and L. E. Keup.
Proceedings of the American Power Conference, Volume 31, p 335-343, 1969. 2 ref.

Descriptors: *Thermal pollution, Biology, *Bioassay, *Temperature, Biological communities, Aquatic habitats, Aquatic life, Thermal powerplants, Fish, Fish food organisms, Food chains, Metabolism, Spawning, Marine biology, Freshwater, Physicochemical properties, Beds under water, Water pollution effects.
Identifiers: *Temperature effects, *Temperature criteria, *Thermal discharge, Fish populations.

A biological study of any proposed area of thermal discharge should be instituted two years prior to the anticipated discharge and should continue for two years following plant installation. The paper summarizes the effects of thermal discharges on biota and methods of their determination and discusses temperature criteria issued by the National Technical Advisory Committee on Water Quality Criteria. A before-and-after environmental study can prevent many problems. Some of the values obtained are: (1) Valuable resources may be located prior to construction and the disposal site can then be modified to preserve them; likewise the lack of resources can be substantiated thereby saving unwarranted expenditures. (2) If damages do occur, the information will provide a basis for corrective procedures. (3) The data will provide information to defend against alleged damages; also, the data may point up benefits to a particularly desirable resource. (4) The experiences and results may save both time and money on the next thermal electric installation.
W72-14401

PREDICTING QUALITY EFFECTS OF PUMPED STORAGE,
Water Resources Engineers, Inc., Walnut Creek, Calif.
C. W. Chen, and G. T. Orlob.
Journal of the Power Division, Proceedings of ASCE, Vol. 98, No. P01, p 65-75, June 1972. 7 fig, 2 tab, 13 ref.

Descriptors: *Water quality, *Hydroelectric plants, *Mathematical models, Thermal stratification, Temperature, Dissolved oxygen, Computers, Algae, Aquatic life, Environmental effects, Environmental engineering, *Virginia, Projections, Model studies.
Identifiers: *Pumped storage operation, Smith Mountain Reservoir (Va).

Pumped storage operation (PSO) affects the water quality and in turn the resident biota. A predictive technique was adapted from a recently developed ecologic model to calculate the environmental changes and to evaluate the alternatives of PSO that might enhance a normal ecological succession, forestalling adverse environmental problems. The model, in an application to Smith Mountain Reservoir, Virginia, predicted accurately for an entire year the daily temperature, dissolved oxygen and other quality constituents of the water at varying depths. PSO, under simulated conditions, was found to improve water quality by deepening the epilimnion. A prolonged pumping schedule at a reduced rate, however, was a better alternative, because it would provide a more stable ecosystem without substantially altering the thermal stratification. Thermal stratification is necessary to regulate energy loss, and thus control evaporation, and to ensure a varied environment suitable for hosting a diverse and stable biota. (Eagle-Vanderbilt)
W72-14405

ENERGY USE IN CALIFORNIA: IMPLICATIONS FOR THE ENVIRONMENT,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
E. J. List.
EQL Report No. 3, December 1971. 58 p, 3 fig, 25 tab, 39 ref. NSF GI-29726.

Descriptors: *Electric power production, *Energy, *California, *Thermal pollution, *Thermal powerplants, Pacific Coast Region, Electrical power, Energy dissipation, Air pollution, Natural gas, Oil, Fuels, Nuclear powerplants, Solar radiation.
Identifiers: *Pacific Gas and Electric Company, Emission levels, Emission factors, Combustion, Energy consumption, Aggregate energy, Air basin.

Energy use in California in 1969 and its implications for thermal and air pollution are examined. The energy consumed within each of eleven designated air basins is considered with respect to the source of the energy and its uses. It is shown that 94% of the energy for the State was provided by hydrocarbon fossil fuels, mainly natural gas and gasoline. Half of the energy demand for the State was within the 9200 square miles constituting the South Coast Air Basin; 36.5% of the total demand was within Los Angeles County alone. Air pollution emission factors characterizing each fuel source for a given use are compiled in the form of units of emittant per unit of energy. It is shown that some fuels for some purposes are inherently 'dirty' energy sources and possible fuel substitutions are suggested. Ambient air heating problems (thermal pollution) from energy released within air basins are considered and the resulting possible changes in ambient air temperature are discussed. In order to control air pollution in high energy demand areas, either energy sources with zero emission factors must be used or the use of fossil fuels as an energy source must be curtailed. (Oleszkiewicz-Vanderbilt)
W72-14408

PHOSPHATES, HEAVY METALS, AND DDT: POLLUTION CONTROL COSTS AND IMPLICATIONS,
For primary bibliographic entry see Field 05G.
W72-14424

DDT IN WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-14431

PROCEEDINGS OF CONFERENCE ON INLAND LAKE RENEWAL AND SHORELAND MANAGEMENT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 05G.
W72-14439

CHEMICAL STUDIES ON TOXINS FROM GYMNODINIUM BREVE AND APHANIZOMENON FLOS-AQUAE,
New Hampshire Univ., Durham. Dept. of Biochemistry.
M. Alam.
PhD Thesis, November 1972. 95 p, 25 fig, 12 tab, 30 ref. OWRR A-013-NH (5) and A-021-NH (2).

Descriptors: *Algal toxins, *Red tide, *Beggiatoa, *Phytotoxicity, *Cyanophyta, *New Hampshire, Marine algae, Phytoplankton, Aquatic plants, Chemical properties, Water quality.
Identifiers: *Kezar Lake (NH).

Part I: This investigation concerns the isolation and chemical characterization of the toxin (s) from Gymnodinium breve which is lethal to marine organisms. Unialgal cultures of G. breve were grown and the toxic material isolated. The partially purified toxin on column chromatography gave a toxic pale yellow glassy residue. The infra-red spectrum indicated presence of a carbonyl group and absence of hydroxyl and aromatic groups. Ultra-violet spectrum indicated toxin possibly contaminated with very small amt of pigment. Molecular weight determined by mass spectrometry and osmometry. On basis of present information it is difficult to assign a definite formula to the toxin from G. breve. Part II: The purpose of this investigation was to isolate and characterize the toxic compound (s) from natural blooms of A.flos-aquae. The toxin was purified and obtained as a pale yellow powder in a chromatographically pure form. The A.flos-aquae toxin was a very basic substance. It differed from saxitoxin in its Rf values and its behavior to several spray reagents. Partially hydrated form had different infra-red spectrum than does saxitixin. On basis of this and other information it is concluded that A.flos-aquae is different from saxitoxin.
W72-14542

THE ECE SYMPOSIUM ON PROBLEMS RELATING TO ENVIRONMENT,
Woodrow Wilson International Center for Scholars, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14546

PERICO ISLAND PERMIT APPLICATION, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 06G.
W72-14564

DDT AND PCB IN FISH,
E. Karppanen, and K. Henriksson.
Suom Elainlaakaril. Vol 77, No 12, p 429-437. 1971. Illus. Map. English summary.
Identifiers: *DDT, *Finland, Fish, *Polychlorinated biphenyls, Water pollution effects.

DDT and PCB (polychlorinated biphenyls) determinations made from various species of fish are presented. The material consisted of 136 samples of fish, from various sites in the Gulfs of Finland and Bothnia and from lake waters in different parts of Finland. Besides some background contamination observable in certain 'clean' waters, a slightly increased content of DDT and PCB was encountered in material from the bays of the Baltic. Increases in the DDT content in occasional lake systems probably depend on an earlier practice of treating timber with DDT compounds, nowadays prohibited. Relatively high contents of PCB received at the mouth of the Kokemaki river, called for a closer study of the material from the Tampere area, where among other industries, a condenser factory which uses PCB is located. A marked increase of the PCB content was observed in samples from waters below the industrial areas of Tampere and Nokia. gas chromatographic analyses revealed, besides the known peaks of technical PCB-compounds used by the industry and which contain 50-60% and 42% chlorine, the presence of other PCB. The occurrence of different known and unknown PCB compounds and their possible transformation is discussed. A control of PCB outlets in the waters is called for and the danger of such outlets in connection with the destruction of small condensers from household appliances like refrigerators and washing machines is stressed.--Copyright 1972, Biological Abstracts, Inc.
W72-14583

GROWTH AND MORTALITY OF CRUCIAN CARP (CARASSIUS CARASSIUS (L.)) MORPHA HUMILIS HECKEL 1840, IN THE NATURAL POND MANSFELDOVA IN THE CENTRAL ELBE BASIN,
Karlova Universita, Prague (Czechoslovakia). Inst. of Zoology.
Karel Cerny.
Vestn Cesk Spol Zool. Vol 35, No 4, p 251-260. 1971. Illus.
Identifiers: Carassius-Carassius-Morpha-Humilis, *Carp, *Crucian carp, Czechoslovakia, *Elbe basin, Growth, Mansfeldova, *Mortality, Natural ponds.

Results are presented of growth analyses of 533 specimens of crucian carps from the natural pond Mansfeldova in the central Elbe basin. The whole material was collected after the pond was poisoned by DDT and HCH in Oct. 1953. Growth rate in this natural pond is low. Furthermore, the

values of annual survival rates, of annual mortality rates and of instantaneous mortality rates were determined in fish specimens. The results are discussed in comparison with other studies concerning the growth of this species in other natural ponds of the Elbe basin and other localities.–Copyright 1972, Biological Abstracts, Inc.
W72-14586

MERCURY STIRS MORE POLLUTION CONCERN.
For primary bibliographic entry see Field 05B.
W72-14619

TOXIC EFFECTS OF CADMIUM: A REVIEW,
Food and Drug Administration, Rockville, Md. Bureau of Drugs.
D. F. Flick, H. F. Kraybill, and J. M. Dimitroff.
Environmental Research, Vol 4, p 71-85, 1971. 87 ref.

Descriptors: *Cadmium, *Toxicity, *Trace elements, *Distribution patterns, Industrial production, Path of pollutants, Epidemiology, Pathology, Air environment, Soil environment, Water pollution effects, Foods, Human diseases.
Identifiers: *Cadmium metabolism, *Cadmiosis, Cadmium accumulation, Industrial use.

The review includes current unpublished and published knowledge on cadmium toxicity. The survey included worldwide epidemiology of the metal, distribution patterns in our environment, industrial production and uses, modes of incorporation into the human body, and possible significance of the metal with respect to metabolism. The findings revealed that cadmium is virtually ubiquitous, deposited and accumulated in various body tissues, and found in varying concentrations throughout all environmental compartments in which man must live. Within the past two decades there has been increased industrial production and use of the metal. Concomitantly, there has been an increased incidence of both acute and chronic cases of clinically identifiable cadmiosis. Cadmium may function in or may be an etiological factor for various pathological processes including testicular tumors, renal dysfunction, hypertension, arteriosclerosis, growth inhibition, chronic diseases of old age, and cancer. In addition, cadmium may result in hemorrhagic lesions in sensory ganglia within the central nervous system. A number of investigators found some toxic aspects of exogenously administered cadmium to be partially or even totally prevented by zinc, cobalt, selenium, estrogen, British antilewisite (BAL) and thiol compounds. (Oleszkiewicz-Vanderbilt)
W72-14621

LEVELS OF ANTIMONY, CADMIUM, CHROMIUM, COBALT, MANGANESE, AND ZINC IN INSTITUTIONAL TOTAL DIETS,
Food and Drug Administration. Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W72-14622

PRELIMINARY STUDY OF MERCURY RESIDUES IN SOILS WHERE MERCURY SEED TREATMENTS HAVE BEEN USED,
Agricultural Research Service. Hyattsville, Md.
For primary bibliographic entry see Field 05B.
W72-14623

MOST ANGLING WATERS MERCURY-SAFE,
R. H. Stroud.
SFI (Sport Fishing Institute) Bulletin, No 218, p 1-3, September 1970.

Descriptors: *Mercury, *Sport fishing, *Freshwater fish, *Water pollution, Legal aspects, Standards, Diets, Fish, Industries, Rivers, Lakes, United States.
Identifiers: Ontario.

It is becoming evident that most waters are mercury-safe from the standpoint of sport fishing and anglers. Probably well over 90 per cent of America's inland waters would fail, on detailed sampling of their aquatic life, to yield fish that are contaminated with dangerous quantities of mercury. The maximum mercury level in fish allowable by the FDA is 0.5 ppm. Studies indicate that both humans and fishes are capable of excreting mercury from their systems at the rate of about 0.05 mg per day. In order to exceed an average safe level intake in total food of 0.05 mg per day, it would be necessary to eat 80 pounds of fish flesh per year - all of it containing the allowable maximum. Waters in 12 states of the U.S. and in Ontario with excessive levels of mercury are listed. The Department of the Interior has urged strong action to halt the discharge of mercury in waste effluents from industrial plants and has taken legal action against eight firms for failure to end their discharges of mercury. (Eagle-Vanderbilt).
W72-14625

THE TRANSITIONAL CONDITION OF MINAMATA BAY AND THE NEIGHBORING SEA POLLUTED BY FACTORY WASTE WATER CONTAINING MERCURY,
Kumamoto Univ. (Japan). Dept. of Hygiene; and Kumamoto Univ. (Japan). Medical School.
M. Fujiki.
Presented at 6th International Water Pollution Research Conference, Jerusalem, Israel, June 18-23, 1972. Paper No 12, Section C, Session 6, June 20, 1972. 13 p, 1 fig, 9 tab, 11 ref.

Descriptors: *Mercury, Water pollution effects, Water pollution sources, Fish, Shellfish, Poisoning, Mud, Aquatic habitats, Pollutant identification.
Identifiers: *Minamata Bay, *Methylmercury, *Acetaldehyde manufacturing, Methylation mechanism, Mercury accumulation.

Since 1960, the mercury content of fish and shellfish collected from Minamata Bay has been measured yearly; results over this period are reported. A brief history of the disease outbreak is given followed by a description of manufacturing processes that lead to disastrous pollution. The mercury content in the muds from various points did not decrease during 7 years, except in a few places where it was probably due to constructional dredging. The mercury compounds in the muds were inorganic such as mercuric oxide and sulfide and the highest concentration of methylmercury in the mud was 0.007 ppm as Hg (wet wt). The mercury concentration in the fish has decreased markedly since 1966 from 12 ppm in 1965 down to 0.2 ppm in 1970. Data on mercury concentration in the hair of the inhabitants are also tabulated. The mechanisms for formation of methylmercury compounds in the reaction fluid of the polluting acetaldehyde plant are based principally on the reaction of inorganic mercury with paracetic acid. It was postulated that methylmercury contamination around Minamata district started long before 1959. (Oleszkiewicz-Vanderbilt)
W72-14628

THE ENRICHMENT OF HEAVY METALS IN SUBMERGED PLANTS,
Ruhrverband, Essen (West Germany).
F. Dietz.
Presented at 6th International Water Pollution Research Conference, Jerusalem, Israel, June 18-23, 1972. Paper No 4, Section A, Session 2, June 19, 1972. 8 p, 1 fig, 10 tab.

Descriptors: *Trace elements, *Heavy metals, *Bioassay, *Aquatic plants, Rooted aquatic plants, Copper, Lead, Zinc, Iron, Manganese, Mercury, Nickel, Mosses, Water pollution effects, *Eutrophication.
Identifiers: *Enrichment factor, *Macro nutrients, *Ruhr River, Atomic absorption, Chloroplants.

Results of an investigation based on the sampling of water and plants and determining the macronutrients and trace heavy metals, are presented. The samples were collected from the Ruhr River and at the confluence of some tributaries. The content of macro-nutrients incorporated in the water plants is largely independent of the local medium and therefore of the water quality. Comparing the enrichment factors for minor elements it was found that the most intense enrichment takes place in mosses. In all the plants tested manganese and zinc showed the most intense enrichment whereas with iron, nickel, copper, lead, no difference in the intensity of enrichment could be observed. Therefore it must be supposed that enrichment is dependent primarily on the species of plant and specific selectivity. Evaluating data with regard to the limits of variability - as referred to the minimal and maximal values - a small variation is found in spite of the many influencing factors. On that account it is to be concluded that the enrichment of minor elements in water plants is useful criterion to calculate the average concentration of these elements in water. By means of a relatively small number of samples it is possible to assess the trend of water pollution by metals. (Oleszkiewicz-Vanderbilt)
W72-14629

IMPROVEMENTS IN THE DETERMINATION METHOD OF METHYL MERCURY IN FISH TISSUES AND THE RATIO OF METHYL MERCURY TO TOTAL MERCURY IN FISH TISSUES,
Kanagawa Prefectural Environmental Control Center, Yokohama (Japan).
For primary bibliographic entry see Field 05A.
W72-14630

MERCURY: ITS HISTORICAL PRESENCE IN NEW YORK STATE FISHES,
New York State Dept. of Environmental Conservation, Rome. Rome Pollution Lab.
E. J. Harris, and R. W. Karcher, Jr.
The Chemist, p 176-179, May 1972. 4 tab, 4 ref.

Descriptors: *Mercury, Water pollution, *Fish, Analytical techniques, Walleye, Bass, Trout, Pollutant identification.
Identifiers: *Background level, *Atomic absorption spectrophotometry.

Fish obtained in New York by the State Conservation Department between 1927 and 1939 and fish from the collections of the American Museum of Natural History, the Philadelphia Academy of Sciences, and Cornell University were analyzed for total mercury content using a flameless Atomic Absorption technique. Dates the fish were caught ranged from 1880 to 1939. Those taken from Lake Ontario and Lake Champlain 30 or 40 years ago contained about as much mercury as those caught today. The buildup of mercury in the biomass is not found to be a phenomenon of recent origin. Mercury has been released to the environment by mirror manufacturers, gold and silver miners, and the burning of coal. Mercury is released naturally through the chemical weathering of rock structures. Despite these sources, there is no evidence to indicate that injury to human health has occurred as a result of eating these fish or that freshwater fish have been damaged by their body burden of mercury. (Eagle-Vanderbilt)
W72-14632

FISH AND MERCURY.

Prevention, p 175-188, January 1972. 3 photos.

Descriptors: *Mercury, *Fish, *Diets, Freshwater fish, Water pollution effects, Marine fish, Environmental effects, Public health.
Identifiers: *Mercury poisoning, *Swordfish, Predators, Mercury accumulation, Industrial discharges, Chemical discharges, FDA food standards.

A general discussion of development of the mercury problem is followed by analysis, from the consumer's viewpoint, of the so called 'swordfish dilemma'. Organic forms of mercury are the most severe pollutants, the metallic form being very significantly less toxic. Doctors and dieticians are quoted recommending variety in food consumption, moderate consumption of fish, concentrating on smaller fish such as mackerel, herring, and sardine, and avoiding larger predators like swordfish which tend to accumulate mercury in their tissue. (Oleszkiewicz-Vanderbilt)
W72-14633

MERCURY POLLUTION: THE MAKING OF AN ENVIRONMENTAL CRISIS,
Massachusetts Inst. of Tech., Cambridge. Lab. of Nuclear Science.
A. Katz.
CRC Critical Reviews in Environmental Control, Vol 2, Issue 4, p 517-534, January 1972. 1 fig, 1 tab, 54 ref.

Descriptors: *Mercury, *Toxicity, *Water pollution effects, *Legal aspects, Water pollution sources, Air pollution, Fish, Seed treatment, Wildlife habitats, Public health, Human pathology, Regulation, Human diseases, Path of pollutants, Standards.
Identifiers: *Methylmercury, *Mercury poisoning, *Governmental regulation, *Intake level, Minamata Disease, Phenylmercury compounds, Mercury transformations, Industrial releases, Industrial use, FDA standards.

Following a historical outline of mercury poisoning incidents in various countries, the sources and uses of Hg are discussed. The largest consumer is the electrical industry (26.6%) followed by the chlor-alkali industry (23.1%) and industrial control equipment manufacturers (10.6%). Methylation pathways under anaerobic and aerobic conditions are presented. The impact of mercury on man depends on the form of the metal. Inorganic mercury poisoning is partially or wholly reversible; methyl mercury poisoning (Minamata Disease) is essentially irreversible. The mercury content in fish is almost totally methyl mercury. Methyl mercury is easily absorbed through the digestive tract into the blood stream. The human body does not detoxify methylmercury, its excretion of organic mercury is very slow. Damage is irreversible when symptoms appear associated with the cerebellar and cerebral regions of the brain. Evidence of possible genetic damage has been noted. A threshold level of brain cell damage may exist, so that long-term exposures may present a major health problem. (Oleszkiewicz-Vanderbilt)
W72-14637

THE METHOD OF SEDIMENTATION OF HYDROCARBONS USED AT THE TIME OF THE 'TORREY CANYON' DISASTER: THE NAUTEX HYDROPHOBE, (LA METHODE DE SEDIMENTATION,
Societe OMYA (France).
For primary bibliographic entry see Field 05G.
W72-14653

VITAL CONDITIONS FOR THE ORGANIZATION OF A THALASSOTHERAPIE CENTER TO FACILITATE INDUSTRIAL MANAGEMENT OF THE LITTORAL, (CONDITIONS INDISPENSABLES POUR L'ORGANISATION D'UN CENTRE DE THALASSOTHERAPIE EN FONCTION DE L'AMENAGEMENT INDUSTRIEL DU LITTORAL),
Federation Internationale de Thalassotherapie.
D. Leroy.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I, 11 p.

Descriptors: *Coasts, *Littoral, Project, Public health, *Environmental effects, *Monitoring, *Tides, *Currents (Water), Biology, Chemistry, Water pollution effects, Balance of nature, Toxicity, Sewage, Treatment facilities.
Identifiers: *Thalassotherapy centers, Readaptation.

The need for the establishment of 'Thalassotherapy' centers near coastal industrial zones is discussed. These centers would monitor the tides, currents, chemistry, biology and pollution of the seas and littoral zones. The qualitative chemical identity between human plasma and sea-water is emphasized. The necessity of man's re-equilibration becomes more important as accumulative poisoning from industrial air and water pollution causes a loss of the ions necessary to normal cellular life. Thus functional readaptation centers are a coming necessity. Sewage discharge and purification facilities are also discussed. (Ensign-PAI)
W72-14654

KAISER REFRACTORIES ENVIRONMENTAL STUDIES, FINAL REPORT: 1 JUNE 1971,
Moss Landing Marine Labs., Calif.
J. P. Harville.
Technical Publication 71-3, June 1971. 178 p, 61 fig, 33 tab, 73 ref, 2 append. NOAA USDC, Grant No. GH-94.

Descriptors: *California, *Industrial wastes, *Environmental effects, *Ecology, *Water structure, *Topography, *Bottom sediments, *Aquatic animals, *Plankton, *Benthic fauna, Fish, Waste dilution, Bioindicators, Laboratory tests, On-site investigations, Water pollution effects.
Identifiers: Kaiser refractories, Moss Landing.

A long range study of potential effects of Kaiser Refractories industrial effluent on the marine environment of the Moss Landing area was undertaken in September 1967. The physical characteristics and dynamics of the water mass were determined and bottom structure, sediments and sediment transport characteristics assessed. The bottom fauna of the proposed outfall area, with ancillary studies of plankton, fishes, and intertidal fauna were investigated. Field and laboratory studies of the impact of various dilutions of Kaiser effluent on selected bioindicator plant and animal species were conducted. (Ensign-PAI)
W72-14656

ECOLOGICAL ASPECTS OF RADIOACTIVITY IN THE MARINE ENVIRONMENT,
Bureau of Commercial Fisheries, Beaufort, N.C. Center for Estuarine and Menhaden Research.
T. R. Rice, and J. P. Baptist.
In: Environmental Radioactivity Symposium, January 19-20, 1970. The Johns Hopkins University, The Department of Geography and Environmental Engineering, Baltimore, Maryland, p 107-180, 14 fig, 10 tab, 93 ref.

Descriptors: *Radioactivity effects, *Ecology, *Environmental effects, *Marine biology, *Biological communities, Cycles, Absorption, Human pathology, Strontium, Cesium, Waste dilution, Dispersion.
Identifiers: Nuclides, Induced nuclides, Fission products, Radionuclide cycling, Biological accumulation.

Four important aspects of environmental radioactivity are discussed in detail, the cycling and biological accumulation of radionuclides, effects of radiation, environmental radiation and man, and the research needs to enable man to cope with the prospect of increased levels of radioactivity in the environment. Only by understanding these aspects of radiation biology of the various species of our diverse ecosystem can effective measures and regulation of the controlled release of radioactivity be achieved. (Ensign-PAI)
W72-14658

STUDIES ON THE EFFECTS OF A STEAM ELECTRIC GENERATING PLANT ON THE MARINE ENVIRONMENT AT NORTHPORT, NEW YORK,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
G. C. Williams, J. B. Mitton, T. H. Suchanek, Jr., N. Gebelein, and C. Grossman.
Technical Report Series No 9, November 1971. 123 p, 44 fig, 9 tab, 59 ref.

Descriptors: *New York, *Power plants, *Stream, *Thermal pollution, *Environmental effects, *Ecology, *Plankton, *Algae, Biological communities, Productivity, Life cycles, Growth stages, Distribution, Behavior, Seasonal, Water pollution effects.
Identifiers: *Northport plant (Long Island).

The results of a continuing group of investigations on effects of the power plant at Northport are summarized. The effects on the plankton community originally in the water used for cooling of steam condensers and discharged back into Long Island Sound were investigated by measuring productivity changes and by a direct seasonal observational study of the life cycle stages, distribution and behavior of plankton algae before and after use. Results left little doubt that waste heat is the primary ecological disturbance in the discharge area. (Ensign-PAI)
W72-14659

INDUSTRIAL FEASIBILITY OF MANMADE ISLANDS CONSTRUCTED FROM THE OFFSHORE DISPOSAL OF DREDGED SPOIL,
Naval Academy, Annapolis, Md.
J. F. Hoffman.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I. 13 p, 3 tab, 15 ref.

Descriptors: *Artificial beaches, *Islands, Construction, *Leaching, *Dredging, *Chemical wastes, *Oil wastes, Environmental effects, Ecology planning, Area redevelopment, Industries, Recreation, Docks.
Identifiers: Airports.

The use of artificial islands constructed from dredge spoil for industrial areas, maritime quays, airports and recreation zones is discussed. The various methods of spoil stabilization and the potential ecological problems such as damage to marine life from careless offloading, metal leaching, chemical discharges, and oil leaks are considered. The controlled development of any resource is necessary in order to prevent destruction of other equally important natural resources. (Ensign-PAI)
W72-14662

RESOURCES, ENVIRONMENTAL PROBLEMS AND TECHNOLOGICAL SOLUTIONS IN CHESAPEAKE BAY,
Army Engineer District, Baltimore, Md.
K. L. Beal.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I. 8 p.

Descriptors: *Chesapeake Bay, *Eutrophication, Loads, *Nutrients, *Chemical wastes, *Sediment load, *Erosion, Environmental effects, Hydraulic models, Future planning (Projected), Management, *Thermal pollution.

The deterioration of Chesapeake Bay by increased nutrient and chemical loads; waste heat; inter- and intra-basin diversions of fresh water; increased sediment loading and erosion is discussed. Hydraulic models were used to study conditions and problems in the bay. The hydraulic model will be of great assistance in designing a viable management scheme to aid in determining the future of the bay. (Ensign-PAI)
W72-14664

METHODS OF FISH RESEARCH CONCERNING THE EFFECTS OF WASTE WATER POISONS, (METHODIK DER FISCHUNTERSUCHUNGEN IM HINBLICK AUF DIE WIRKUNG VON ABWASSERGIFTEN),
Munich Univ. (West Germany). Zoologisch-Parasitologisches Institut.
H. H. Reichenbach-Klinke.
In: Methodik der Untersuchung von Abwasser und Vorfluter, Munchen und Wien, p 60-68, 1971. 6 fig, 5 ref.

Descriptors: *Waste water (Pollution), *Toxicity, *Poisons, Research priorities, Phenols, Detergents, Chemical wastes, Pesticides, Fish physiology, Water pollution effects.
Identifiers: Anatomical studies, Histological studies.

Research methods to determine the toxicological effects of wastewater poisons on fish are discussed. Possibilities for this research are: registration of the phases of fish damage; anatomical and histological studies; taste tests and laboratory toxicity tests. The different stages of fish toxicity are described along with the various changes in fish tissues. The value and problems of the toxicological tests are analyzed. Distinct temporal intervals between water analyses and micro-analyses of fish organs with regard to common poisons such as phenols, detergents, cyanides and pesticides are recommended. (Ensign-PAI)
W72-14665

SOME ECOLOGICAL POINTS REGARDING WATER POLLUTION, (EINIGE OKOLOGISCHE GESICHTSPUNKTE BEIM GEWASSERSCHUTZ),
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
For primary bibliographic entry see Field 05B.
W72-14669

WATER POLLUTION BY OIL. THE PROBLEM OF PERSISTENT CHEMICALS PRESENT IN THE ENVIRONMENT, (VERUNREINIGUNG DER GEWASSER DURCH OL. ZUM PROBLEM DER PERSISTENTEN CHEMIKALIEN IN DER UMWELT),
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-14670

EFFECTS OF 'RED MUD' ON EMBRYOS AND LARVAE OF THE HERRING CLUPEA HARENGUS, (WIRKUNGEN VON 'ROTSCHLAMM' AUF EMBRYONEN UND LARVEN DES HERINGS CLUPEA HARENGUS),
Biologische Anstalt Helgoland (West Germany).
H. Rosenthal.
Helgolander Wissenschaftliche Meeresuntersuchungen, Hamburg, Vol 22, No 3-4, p 366-376, December 1971. 6 fig, 3 tab, 8 ref.

Descriptors: Industries, *Aluminum, Wastes, *Mud, *Herrings, *Larvae, *Embryonic growth stage, *Mortality, *Growth rates, Environmental effects, Fish physiology, Absorption, Feeding rates, Water pollution effects.
Identifiers: *Red mud, Ferric hydroxide, North Sea.

In aluminum production, treatment with water dissolves the aluminum, but iron remains undissolved as ferric hydroxide or red mud. The biological effects of red mud, soon to be released into the North Sea in large quantities, on herring eggs and larvae from Baltic spring spawners were tested. Eggs were artificially fertilized and incubated in 1 liter aerated containers. The addition of red mud reduced percentages of survival to about 40-50%. The red mud particles adhered to the eggshells, forming an almost regular layer, thereby interfering with gaseous and other exchanges between eggs and surrounding medium. Speed of development was retarded and a number of embryonic malformations increased with increasing concentrations. Many larvae absorbed red mud particles blocking their food intake. (Ensign-PAI)
W72-14672

DISCOLORATION OF ALGAL BLOOMS AND SEAWEEDS (VEGETATIONSFARBUNGEN UND WASSERBLUTEN),
Oesterreichische Gesellschaft fuer Meteorologie, Vienna (Austria).
F. Wawrik.
Wetter und Leben, Vol 23, No 9-10, p 203-210, 1971. 11 ref.

Descriptors: Water pollution effects, *Organic matter, *Decomposing organic matter, *Eutrophication, *Phytoplankton, *Algae, *Aquatic weeds, *Weeds, *Red tide, Coasts, Lakes, Ponds, Water pollution control, Aircraft, Copper sulfate.

The complex phenomena of organic water pollution, observed in pools, alpine lakes and coastal areas, are discussed. Causes and consequences of organic pollution and control of harmful seaweeds are included. The first few blooms of the red tide are controlled by the use of CuSo4-crystals dispersed from airplanes. (Ensign-PAI)
W72-14673

INVESTIGATIONS INTO THE DISTRIBUTION OF INORGANIC NITROGEN COMPOUNDS IN RELATION TO THE INCREASING DETERIORATION OF THE WATER IN THE BALTIC SEA (UNTERSUCHUNGEN UBER DIE VERTEILUNG DER ANORGANISCHEN STICKSTOFFVERBINDUNGEN I M HINBLICK AUF DIE ZUNEHMENDE WASSERVERSCHLECHTERUNG IN DER OSTSEE),
Deutsche Akademie der Wissenschaften zu Berlin, Rostock (East Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 05B.
W72-14674

PETROLEUM HYDROCARBONS: UPTAKE AND DISCHARGE BY THE MARINE MUSSEL MYTILUS EDULIS,
Scripps Institution of Oceanography La Jolla, Calif.
R. F. Lee, R. Sauerheber, and A. A. Benson.
Science Vol 177, No 4046, p 344-346, July 28, 1972. 2 tab, 14 ref. NSF GB-24834 NIH ES-00603.

Descriptors: *Oily water, *Aromatic compounds, *Mussels, *Absorption, Oil pollution, Water pollution effects, Organic compounds, Aquatic life, Marine animals, Seawater.
Identifiers: *Mineral oil, *Heptadecane, *Bioaccumulation, Mytilus spp., 1,2,3,4-tetrahydronaphthalene, Toluene, Naphthalene, 3,4-benzopyrene, Tetralin.

The common marine mussel Mytilus edulis has been observed to rapidly take up mineral oil, (C-14) heptadecane, 1,2,3,4-tetrahydronaphthalene, (C-14) toluene, (C-14) naphthalene, and (H-3)3,4-benzopyrene from seawater solution. This species of mussel did not metabolize any of these compounds, and transfer of the mussel to fresh seawater, after exposure to the hydrocarbon in solution, resulted in the discharge of most of the hydrocarbon, although significant amounts remained (between 1 and 400 micrograms per mussel). The nontoxic parafinic hydrocarbons, mineral oil and heptadecane, were taken up (10 milligrams per mussel) to a much greater extent than the aromatic hydrocarbons (2 to 20 micrograms per mussel). (Svensson-Washington)
W72-14683

SIZE-RELATED METABOLIC RESPONSES OF THE PINFISH LAGODON RHOMBOIDES, TO SALINITY VARIATIONS AND SUB-LETHAL PETROCHEMICAL POLLUTION,
Texas Univ., Port Aransas. Inst. of Marine Science.
T. C. Kloth, and D. E. Wohlschlag.
Contributions in Marine Science, Vol 16, p 125-137, 1972. 1 fig, 5 tab, 37 ref. NSF - GB6889.

Descriptors: *Saline water, *Fish physiology, *Fish behavior, *Chemical wastes, Salinity, Water pollution effects, Respiration, Metabolism, Growth stages, Industrial wastes, Oily water, *Oil wastes.
Identifiers: *Petrochemical effluent, *Sublethal effects, *Pinfish, Lagodon spp.

The effects of salinity variations on the respiratory metabolism of large and small pinfish in unpolluted water and in water slightly polluted with a 0.5% petrochemical effluent were investigated at near saturation dissolved oxygen levels and at a near optimum temperature of 20C. A salinity range of 20-45 ppt did not significantly affect the respiratory metabolism of large or small pinfish in unpolluted water. However, sustained swimming velocities were found at 20 ppt, for both large and small pinfish, and the velocities decreased as salinity increased. Sustained swimming velocities of large pinfish decreased more than those of small pinfish. Sublethal pollution uniformly depressed small fish metabolism at all salinities. With large pinfish, pollution depressed metabolism at 20 and 32 ppt, but elevated metabolism at 45 ppt. Multiple regression analysis showed that salinity had a statistically significant effect on respiration only with large pinfish in polluted water. (Svensson-Washington)
W72-14684

THE TOXICITY OF 140 SUBSTANCES TO THE BROWN SHRIMP AND OTHER MARINE ANIMALS.
Ministry of Agriculture, Fisheries and Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
J. E. Portmann, and K. W. Wilson.
Ministry of Agriculture, Fisheries and Food, Shellfish Information Leaflet No 22, December 1971. 11 p, 1 tab, 4 ref.

Descriptors: *Toxicity, *Bioassay, Marine animals, *Pollutants, Oysters, Crabs, Bullheads, Shrimp, *Pink shrimp, *Shellfish, Polychlorinated biphenyls, Water pollution, Pesticides, Inorganic compounds, Organic compounds, Lethal limit, Water pollution effects.
Identifiers: Starfish, Flatfish, Shore crabs, Cockles, *Brown shrimp, Armed bullheads, Surface active agents, Solvent emulsifiers, LC50.

A table is presented giving LC50 values for the substances tested. The toxic materials include surface active agents, solvent emulsifiers, pesticides, Polychlorinated biphenyls, pure inorganic chemicals, and pure organic chemicals. Between eight and twenty-five test animals were exposed to serial dilutions in seawater of the chemical under test. The usual test period was 48 hr. Test organisms included pink shrimp, brown shrimp, cockles, armed bullheads, flatfish, starfish, shore crabs and oysters. (Svensson-Washington)
W72-14686

REACTIONS OF YOUNG SALMONIDS TO SUDDEN CHANGES OF PH, CARBON-DIOXIDE TENSION AND OXYGEN CONTENT,
Uppsala Univ. (Sweden).
L. B. Hoglund, and J. Hardig.
Institute of Freshwater Research, Drottningholm, Sweden, Report No 49, p 76-119, 1969. 10 fig, 5 tab, 60 ref.

Descriptors: *Atlantic salmon, *Dissolved oxygen, *Carbon dioxide, *Bioassay, *Fish

physiology, *Acidic water, Salmonids, Water pollution effects, *Hydrogen ion concentration, Respiration, Fish behavior, Bicarbonates, Hardness (Water), Water quality, Ventilation.
Identifiers: Oxygen tension, Carbon dioxide tension, Chromatophore reactions.

Decreasing pH, combined with increasing CO2 tension, provokes changes in locomotor behavior and ventilation among second-summer parr of Atlantic Salmon. Extremely adverse pH/CO2 conditions, in combination with low 02, also give rise to delayed chromatophore reactions. The locomotor reactions, mainly due to CO2, are particularly intense on the introduction of a changed water quality into the test apparatus. The intensity of reaction depends on the time of contact, the combination and the quantity of the external factors varied, i.e. the degree of deviation from the pre-acclimatization water quality, which is the control condition of the tests. Similar reactions but reversed in time and less intense also occur after a test period in conjunction with and after the return once again to control conditions. Pure oxygen depletion--down to a critical value in the range of 1-3 mg/l--provokes hyperventilation, but does not initiate any changes in behavior, e.g. any locomotor activities. Similar experiments, starting with a softer surface water from the River Dalalven, confirm that the reactions displayed in Uppsala water are mainly due to CO2. (Svensson-Washington)
W72-14688

ENVIRONMENTAL LIMITS OF PLANTS IN FLOWING WATERS,
Durham Univ. (England). Dept. of Botany.
B. A. Whitton.
Symposium of the Zoological Society of London, No 29, p 3-19, 1972. 60 ref.

Descriptors: *Running waters, *Aquatic plants, *Aquatic environment, Water pollution effects, Streams, Rivers, Rooted aquatic plants, Aquatic algae, Water temperature, Acid streams, Hydrogen ion concentration, Heavy metals, Dissolved oxygen, *Plant growth, Light intensity, Toxicity, Primary productivity, Standing crops, *Photosynthesis.
Identifiers: Diversity indices.

A review is presented summarizing the literature and some unpublished data on attached photosynthetic plants in certain extreme flowing water environments. With upper temperature limits, it is possible to compare situations occurring naturally and those arising as a result of pollution. Such comparisons show up obvious anomalies. The limits of plants under low pH conditions and high levels of heavy metals are also reviewed, although with these extremes the data are insufficient for comparison of natural and polluted conditions. Sections of a more speculative nature are added on light, climate, and dissolved oxygen as factors which at high and low levels may limit the growth of plants. The quantitative methods which have been used for comparing the effects of extreme environments on plants fall into four main categories: use of toxicity tests; use of diversity indices; measurement of primary production; measurement of standing crops. These methods do not necessarily give similar results. An improvement in methods of quantifying the extent to which an environment is extreme is important if the significance of environmental limits of plants in natural and polluted waters is to be evaluated. (Svensson-Washington)
W72-14690

EFFECT OF TOXIC WASTES ON TREATMENT PROCESSES AND WATERCOURSES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05D.
W72-14691

FILAMENTOUS ALGAE AS WEEDS,
Durham Univ. (England). Dept. of Botany.
B. A. Whitton.
In: 3rd Symposium on Aquatic Weeds, European Weed Research Council, Oxford, 1971, p 249-263. 40 ref.

Descriptors: *Eutrophication, *Aquatic algae, *Algal control, *Aquatic weed control, Biochemical oxygen demand, Lake stages, Limnology, Nuisance algae, Nutrient removal, Nutrients, Water pollution effects, Water quality, Herbicides, Odor-producing algae.
Identifiers: *Filamentous algae, *Aquatic angiosperm weeds, Cladophora.

It still remains difficult to evaluate the nuisance value of filamentous algae on a world scale, and it would at present be impossible to estimate even roughly their economic significance, either as an absolute value or in comparison with that of aquatic angiosperm weeds. It does, however, seem clear these algae are a special nuisance in at least two rather different types of situation. They are a problem at the edges of several large lakes, like Ontario and Zurich, which have a high amenity value, and which have been subject to considerable eutrophication in recent years. They are also a particular problem in warm dry climates in channels used for the transport of water for irrigation and other purposes. They may also be a problem in many other types of situation, as for instance the drainage ditches of flat, low-lying areas like parts of the Netherlands, but they then often occur together with aquatic angiosperm weeds, and both these latter and the filamentous algae can now be treated simultaneously by chemical means. (Svensson-Washington)
W72-14692

TOXICITY OF HEAVY METALS TO FRESHWATER ALGAE: A REVIEW,
Durham Univ. (England). Dept. of Botany.
B. A. Whitton.
Phykos, Vol 9, No 2, p 116-125, 1970. 38 ref.

Descriptors: *Reviews, *Heavy metals, *Algae, *Aquatic environment, *Toxicity, *Water pollution effects, Zinc, Lead, Copper, Chromium, Silver, Chlorophyta, Cyanophyta, Algal control, Algicides, Copper sulfate, Salinity, Hardness (Water), Chelation, Mine drainage, Water properties.
Identifiers: *Freshwater algae, EDTA.

A review is presented of the literature on toxicity of heavy metals to freshwater algae. Metals considered include zinc, lead, copper, chromium, and silver. The account is concerned mainly with field observations and those laboratory studies which are particularly helpful in interpreting field data. Effects of salinity, water hardness, and organic complexation on toxicity are discussed. (Svensson-Washington)
W72-14694

EFFECTS OF DRESSING AND COOKING ON DDT CONCENTRATIONS IN CERTAIN FISH FROM LAKE MICHIGAN,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Great Lakes Fishery Lab.
R. E. Reinert, D. Stewart, and H. L. Seagran.
Journal of the Fisheries Research Board of Canada, Vol 29, No 5, p 525-529, 1972. 1 fig, 4 tab, 3 ref.

Descriptors: *Pesticide residues, *DDT, *Public health, *Pesticide removal, *Yellow perch, *Lake trout, Pesticides, Insecticides, Chlorinated hydrocarbon pesticides, *Lake Michigan, Salmon, Foods.
Identifiers: *Coho salmon, *Bloaters, *Food processing effects, Perca spp., Coregonus spp., Salvelinus spp., Oncorhynchus spp., Cooking effects, Dressing effects.

Concentrations of DDT residues were highest in parts of the body with the highest oil content in four species of fish from Lake Michigan: yellow perch (Perca flavescens), bloater (Coregonus hoyi), lake trout (Salvelinus namaycush), and coho salmon (Oncorhynchus kisutch). Dressing reduced the DDT levels and oil content by more than 90% in yellow perch, but had little effect in the other three species. The concentration of DDT residues in bloaters was changed little by smoking, but was reduced 64-72% by other methods of cooking: from 8.0 mg/kg (raw) to 2.2 mg/kg after frying in corn oil; from 10.7 to 3.9 mg/kg after frying in lard; and from 9.1 to 3.2 mg/kg after broiling. The concentration of DDT residues in fillets of yellow perch changed only from 0.3 mg/kg (raw) to 0.4 or 0.5 mg/kg after baking, frying or broiling. (Svensson-Washington)
W72-14695

THE NATURE AND MAGNITUDE OF THE EFFECT OF KRAFT MILL EFFLUENTS ON SALMON,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
C. C. Walden, and T. E. Howard.
Paper presented to the International Symposium on Identification and Measurement of Environmental Pollutants, June 17, 1971, Ottawa, Canada. 29 p, 6 fig, 3 tab, 41 ref.

Descriptors: *Pulp wastes, *Toxicity, Water pollution effects, Water quality, *Salmon, Bioassay, Industrial wastes, *Bleaching wastes, Chemical wastes, Effluents, *Sulfite liquors, Sulfides, Alkalis (Bases), Lethal limit.
Identifiers: *Sublethal effects, Methyl mercaptans, Resin acids.

The toxicity to salmon of kraft mill effluents varies widely between mills and, with time, within individual mills. The inherent toxicity of kraft mill effluents is low, but it is of consequence because of the tremendous volumes discharged and because all major process sewers demonstrate a toxicity. Molecular entities responsible for toxicity of pulping effluents have been only partially identified and include sulfides, ethyl mercaptan, excess hydroxyl ion and resin acids, of which only the latter is of significance in most field situations. Data relating to bleach effluents are almost totally lacking. Thus comparative standards cannot be prepared for chemical or biological evaluations and even comparison between mills is difficult. Measurement of sublethal effects is necessary to ensure the validity of discharge requirements, now based on standard lethal bioassay procedures. A variety of behavioral, biochemical and physiological changes in fish tissues have been reported. A 'clinical profile' suggests an immediate stress reaction upon exposure, with the possibility of ill defined chronic effects also occurring. Estimates of the threshhold level of response are about 0.12 to 0.24 TLm96 value. One quantitative technique has been developed for measuring this threshhold value. (Svensson-Washington)
W72-14697

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH, REPORT ON MONOHYDRIC PHENOLS AND INLAND FISHERIES.
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.

European Inland Fisheries Advisory Commission Technical Paper No 15, 1972. 18 p, 2 tab, 99 ref.

Descriptors: *Phenols, *Freshwater fish, *Toxicity, *Water quality standards, *Chemical oxygen demand, chemical wastes, Water pollution sources, Water pollution effects, Fisheries, Water quality, Salmonids, Absorption, Water temperature, Taste, Organic compounds, Commercial fish, Europe, Aquatic environment, Rough fish.

Identifiers: *Phenolic wastes, Xylenol, Cresol, Sublethal effects.

Phenolic wastes can contain monohydric phenols, including phenol, the three cresol isomers, and the six xylenol isomers, together with other substances. They may adversely affect freshwater fisheries by their direct toxicity to fish and fish food organisms, by their high oxygen demand resulting in oxygen depletion of the receiving water, and by the production of undesirable flavors in the edible flesh of fish. Laboratory tests show that the toxicity of phenol is increased by decrease in dissolved oxygen concentration, increase in salinity, and decrease in temperature. Salmonids and newly hatched fish are more sensitive than coarse fish and adults respectively. Cresols, xylenols, and phenols are of similar toxicity, and the toxicity of mixtures of phenols is apparently additive, although the toxicity of phenolic wastes may be greater than expected from chemical analyses, since these may not be equally sensitive to all phenols and may neglect the contribution from other poisons. Tentative criteria for salmonid, coarse fish, and commercial fisheries are given. They range from 0.5 mg/l to 2.0 mg/l depending on type of fish, the phenolic waste, and temperature conditions. (Svensson-Washington)
W72-14698

EFFECTS OF LONG-TERM EXPOSURE TO CARBARYL (SEVIN) ON SURVIVAL, GROWTH, AND REPRODUCTION OF THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
National Water Quality Lab., Duluth, Minn.
A. R. Carlson.
Journal of the Fisheries Research Board of Canada, Vol 29, No 5, p 583-587, 1972. 4 tab, 18 ref.

Descriptors: *Pesticide toxicity, *Carbamate pesticides, *Fish physiology, Minnows, Pesticides, Insecticides, Lethal limit, Mortality, Animal growth, Reproduction, Larvae.
Identifiers: *Fathead minnows, *Sevin, *Sublethal effects, Pimephales spp., Carbaryl, 1-Naphthyl methylcarbamate.

When fathead minnows were exposed to five concentrations (0.008-0.68 mg/l) of the insecticide carbaryl for 9 months and throughout a life cycle, the highest concentration prevented reproduction and decreased survival. At the high concentration, testes contained motile sperm and ovaries contained flaccid eggs and appeared to be in a resorptive state. Also at the 0.68 mg/l concentration, carbaryl appeared to contribute to mortality of larvae (produced by unexposed parents) within 30 days of hatching. Survival of young grown in the 0.008 mg/l concentration was reduced. Since no demonstrable effects were noted for survival, growth or reproduction at the 0.017, 0.062, and 0.21 mg/l concentrations, this low survival value is considered not due to carbaryl. The 96 hr median tolerance concentration (TL-50) and the lethal threshold concentration (LTC) for 2 month old fathead minnows were 9.0 mg/l. The maximum acceptable toxicant concentration (MATC) for fathead minnows exposed to carbaryl in water with a hardness of 45.2 mg/l and pH of 7.5 lies between 0.21 and 0.68 mg/l. (Svensson-Washington)
W72-14699

TISSUE CULTURE BIOASSAY METHOD FOR WATER POLLUTION WITH SPECIAL REFERENCE TO MERCURIC CHLORIDE,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 05A.
W72-14700

TRANSFER OF MERCURY FROM FISHES TO SARCOSAPRO-PHAGOUS FLIES,
Helsinki Univ. (Finland).
For primary bibliographic entry see Field 05B.
W72-14701

IMPACTS OF OIL ON THE GULF COAST,
Louisiana Wild Life and Fisheries Commission, New Orleans.
L. S. St. Amant.
In: Transactions of the 36th North American Wildlife and Natural Resources Conference, March 7-10, 1971, p 206-219, 1971. 9 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Regulation, *Water policy, *Gulf of Mexico, *Louisiana, Water pollution sources, Oil, Oil industry, Oily water, Oil spills, Oil wastes, Environmental sanitation, Natural gas, Oysters, Management, Water pollution control, Ecology.
Identifiers: Sublethal effects.

The coast of Louisiana is a unique, geologically unstable, highly productive area of both petroleum products and environmentally dependent living resources. The rise in petroleum production coincidentally parallels a rise in fisheries production. After 1950, the impact of petroleum industry activities on fishery production, particularly oyster growing, became evident; this led to a pollution control system, the development of a marine research program and the birth of an administrative procedure designed to protect the coastal environment. Much of this work necessarily dealt with the gross and more immediate effects of industrial activities on coastal ecology and natural resource production. The accumulative results of the introduction of sublethal amounts of oil or other pollutants into the environment for long periods of time and the additive effect of apparently innocuous ecological changes are unknown. These two factors may, in the long run, result in disastrous management of the environment if decisions are based only on the obvious short term effects of multiple use programs on eco-systems. (LeGore-Washington)
W72-14702

THE EFFECT OF HIGH WATER TEMPERATURE ON THE RAZOR CLAM, SILIQUA PATULA (DIXON),
Washington State Dept. of Fisheries, Ocean Park.
C. S. Sayce, and D. F. Tufts.
1971 Proceedings, National Shellfisheries Association, Vol 62, p 31-34, 1972. 2 fig, 2 tab, 9 ref.

Descriptors: *Lethal limit, *Water pollution effects, *Thermal pollution, *Bioassay, *Clams, Water temperature, Sea water, Cooling water, Mortality, Heated water, Nuclear powerplants, Washington.
Identifiers: *Razor clams, Siliqua spp.

Razor clams, in groups of ten, were exposed to warmed seawater for periods of 1,2,3, and 4 hr, then returned to ambient seawater, in two series of experiments. The seawater temperatures used in the first series were 20 C through 29 C in 1.0 degree increments. Mortalities were recorded for a 48 hr period following exposure to the experimental temperature. Mortalities began at 21 C with one clam dying after a 4 hr exposure. One hundred per cent mortalities occurred at 26 C after a 4 hr exposure, at 27 C after a 3 hr exposure, at 28 C after a 2 hr exposure, and at 29 C after a 1 hr exposure. By inspection, LD-50 appears to range from about 22.5 C for razor clams exposed 4 hr to about 27.5 C for razor clams exposed 1 hr to warmed seawater. The second series of experiments was conducted at 5, 10, 15, and 20 C above ambient temperature. Mortalities began (10%) after 4 hr exposure to seawater 10 C above ambient. The LD-50 point was 11.2 C after 4 hr exposure, 14.1 C after 3 hr exposure, 14.3 C after 2 hr and 14.8 C after the 1 hr exposure. (Svensson-Washington)
W72-14703

COELOMOCYTE AGGREGATION IN CUCUMARIA FRONDOSA: EFFECT OF ETHYLENEDIAMINETETRAACETATE, ADENOSINE, AND ADENOSINE NUCLEOTIDES,
Memorial Univ. of Newfoundland, St. John's.
P. B. Noble.
Biological Bulletin, Vol 139, p 549-556, December 1970. 2 fig, 1 tab, 17 ref.

Descriptors: *Chelation, *Cytological studies, *Invertebrates, Animal physiology, Calcium, Magnesium, Water pollution effects.
Identifiers: *EDTA, *Sea cucumbers, *Coelomocytes, *Adenosine, Ethylene-diaminetetraacetate, Cucumaria spp., Holothurians, Morphological changes.

Cells found within the coelomic cavity of the sea cucumber, Cucumaria frondosa, aggregated rapidly upon removal from the body. This cell aggregation is normally characterized by a morphological change in the bladder amoebocyte which becomes a filiform cell. A method has been devised whereby the effects of EDTA, adenosine, and adenosine nucleotides could be observed upon coelomocyte aggregation. EDTA at pH 6.0 in artificial seawater (Ca (2+) and Mg (2+) free) prevented the morphological change from bladder to filiform amoebocyte as well as cell aggregation. EDTA at pH 7.8 in artificial seawater (Ca (2+) and Mg (2+) free) did not prevent the morphological change although it did prevent cell aggregation. Based on the different chelating affinities of EDTA for calcium ions at these two different pH values, it is suggested that coelomocyte aggregation has two components: (1) the morphological change, which is Ca (2+) independent and possibly requires the removal of some other cation or is a direct effect of EDTA upon some cellular component, and (2) the cell aggregation itself, which appears to be Ca (2+) dependent. Adenosine and adenosine nucleotides in general did not appear to influence coelomocyte aggregation. These results raise the question as to whether or not the mechanism of coelomocyte aggregation is similar to and can be described in the same terms as the mechanism currently used to explain avian and mammalian cell aggregation. (Svensson-Washington)
W72-14704

SOME COMMENTS UPON ACID-BASE BALANCE IN TELEOST FISHES AND ITS RELATIONSHIP TO ENVIRONMENTAL TEMPERATURE,
Marquette Univ., Milwaukee, Wis. Dept. of Biology.
A. H. Houston.
Comparative Biochemistry and Physiology, Vol 40A, p 535-542, 1971. 1 fig, 1 tab, 44 ref.

Descriptors: *Fish physiology, *Water temperature, *Teleosts, Hydrogen ion concentration, Acidity, Alkalinity, Water pollution effects.
Identifiers: *Acid-base regulation, Poikilotherms, Homeotherms.

It has been hypothesized that acid-base regulation in mammalian species is directed toward stabilization of body fluid pH, whereas among the poikilotherms control centers upon the maintenance of relative alkalinity. Consequently, given the known relationship between temperature and the dissociation constant of water reductions in mammal body temperature should be accompanied by decreases in the OH (-)/H (+) ratio while, under similar circumstances, the pH of the poikilothermic body fluid system should increase. Although this hypothesis appears to have been validated with respect to homeothermic and poikilothermic tetrapods, extension of the concept of relative alkalinity regulation to teleost fishes is not wholly consistent with the data presently available. Recorded blood and plasma pH values for teleost fishes are generally below those reported for amphibians and reptiles, tending to fall within or below the levels observed in mammals

under comparable thermal conditions. Moreover, they seemingly display little tendency to vary in an inverse fashion with temperature. (Svensson-Washington)
W72-14705

THE EFFECT OF CCC AND DIETHYLAMINE HYDROCHLORIDE ON CERTAIN SPECIES OF ALGAE BELONGING TO CYANOPHYCEAE, CHLOROPHYCEAE, AND DIATOMEAE,
Bialystok Medical Academy (Poland). Dept. of Biology.
R. Czerpack.
Acta Hydrobiologia, Vol 12, No 2-3, p 143-151, 1970. 5 fig, 33 ref.

Descriptors: *Inhibition, *Plant growth regulators, *Chlorides, *Cyanophyta, *Chlorophyta, *Chrysophyta, Toxicity, Inhibitors, Toxins, Inorganic compounds, Algae, Diatoms, Chlamydomonas, Scenedesmus, Bio-assay, Resistance, Lethal limit, Poisons, Water pollution effects.
Identifiers: *Chlorocholine chloride, *CCC, *Diethylamine hydrochloride, Merisomopedia spp., Anabaena spp., Gomphonema spp., Nitzchia spp., Sensitivity.

The effects of chlorocholine chloride (CCC) and diethylamine hydrochloride on the concentration of cells, their size, total chlorophyll content and the dynamics of the growth of nine species of algae belonging to Cyanophyceae (Merismopedia glauca, Anabaena cylindrica), Chlorophyceae (Chlamydomonas nivalis, Scenedesmus quadricauda, S. acuminatus, S. basiliensis, S. bijugatus), and Diatomeae (Gomphonema parvulum, Nitzchia palea) were investigated. Diethylamine, the chemical analog of CCC, had similar effect--even a somewhat stronger one--to that of CCC as a typical growth retardant at similar concentrations. Both growth regulators had an inhibitory effect on the cell concentration, their growth dynamics, and the total chlorophyll content of the algae. The Diatomeae and filamentous Cyanophyceae were the most sensitive to the regulators investigated. On the other hand, a slight stimulatory effect was observed with Chlorophyceae when the chemicals were applied in concentrations of 10 to the (-5) power to 10 to the (-7) power M. (LeGore-Washington)
W72-14706

ABSENCE OF POLYCHLORINATED BIPHENYLS IN HUMAN MILK AND SERUM FROM TEXAS AND HUMAN MILK FROM NEW GUINEA,
William Beaumont General Hospital, El Paso, Tex.
For primary bibliographic entry see Field 05B.
W72-14708

EFFECTS OF MIREX ON SELECTED ESTUARINE ORGANISMS,
Environmental Protection Agency, Gulf Breeze, Fla.
J. I. Lowe, P. R. Parrish, A. J. Wilson, P. D. Wilson, Jr., and T. W. Duke.
In: Transactions of the 36th North American Wildlife and Natural Resources Conference, March 7-10, 1971, p 171-186, 1971. 2 fig, 4 tab, 9 ref.

Descriptors: *Water pollution effects, *Pesticide toxicity, *Bioassay, *Toxicity, *Organic pesticides, Lethal limit, Chemcontrol, Shrimp, Pink shrimp, Crabs, Crustaceans, Persistence.
Identifiers: *Mirex, *Fire ant control, Brown shrimp, Penaeus spp., Palaemontes spp., Grass shrimp, Callinectes spp., Fiddler crabs, Uca spp., Pinfish, Lagodon spp.

Exposure to mirex (dodecachlorooctahydro- 1, 3, 4-metheno-2H-cyclobuta (cd) pentalene) under laboratory conditions affects certain estuarine crustaceans by causing irritability, loss of equilibrium, undirected movement, paralysis, and, frequently, death. Juvenile brown shrimp, Penaeus aztecus, and grass shrimp, Palaemonetes pugio, died after exposure to mirex fire ant bait at levels as low as one particle of bait per shrimp in standing seawater. Juvenile pink shrimp, Penaeus duorarum, died after exposure to technical mirex dissolved in flowing seawater. Although only 25% of a population of pink shrimp died during a 7 day exposure to 1.0 microgram/liter of mirex, all remaining shrimp died within four days after being placed in mirex-free seawater. Mirex was toxic to juvenile blue crabs, Callinectes sapidus, and to fiddler crabs, Uca pugilator. Mirex was apparently not toxic to pinfish, Lagodon rhomboides. Mirex can be transferred through simple food chains in laboratory experiments. The insecticide mirex remained in fire ant bait months after the bait was placed in open seawater. About 34% of the mirex in samples of bait was still present after 9 months of soaking in seawater. (LeGore-Washington)
W72-14710

MONITORING OF ORGANO-CHLORINE RESIDUES IN FISH FROM AROUND ENGLAND AND WALES, WITH SPECIAL REFERENCE TO POLYCHLORINATED BIPHENYLS (PCBS),
Ministry of Agriculture, Fisheries and Food, Burhham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W72-14711

THE LEVELS OF CERTAIN METALS IN FISH FROM COASTAL WATERS AROUND ENGLAND AND WALES,
Ministry of Agriculture, Fisheries and Food, Burhham-on-Crouch (England). Fisheries Lab.
J. E. Portmann.
International Council for the Exploration of the Sea, Fisheries Improvement Committee, C. M. 1971/E:13, 1971. 8 p, 2 tab, 2 ref.

Descriptors: *Heavy metals, *Marine fish, *Assay, Water pollution effects, Cadmium, Chromium, Copper, Lead, Mercury, Zinc, Coasts, Herring, Public health.
Identifiers: Cod, Whiting, Plaice, Mackerel.

Samples of fish, each usually consisting of ten individuals of each species, were collected twice yearly from nine representative ports around England and Wales. The species sampled were: cod, whiting, plaice, herring and mackerel. In addition, samples of these and other common commercial species were collected from the North Sea and distant-water fishing grounds. The muscle tissue of each individual fish, together with a homogenate of the bulked livers of each sample, was analyzed for cadmium, chromium, copper, lead, mercury, and zinc by atomic absorption spectrophotometry. Results are given in tabular form. (Svensson-Washington)
W72-14712

THE USE OF PHOTOGRAPHY IN WATER QUALITY RESEARCH,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05A.
W72-14728

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-14765

CARBON AND NITROGEN AS REGULATORS OF ALGAL GROWTH IN TREATED SEWAGE,
Kentucky Water Resources Inst., Lexington.
G. Foree, and R. Scroggin.
Available from the National Technical Information Service as PB-212 375, $3.00 in paper copy, $0.95 in microfiche. Research Report No. 49, March 1972. 61 p, 15 fig, 7 tab, 32 ref. OWRR A-023-KY (2).

Descriptors: *Carbon, *Nitrogen, *Algae, Plant growth, Sewage effluents, Regulation, Cyanophyta, Chlorophyta, Hydrogen ion concentration, Chemical porperties, Nitrogen fixation, Cultures, Carbon dioxide, Nutrients, Limiting factors, Allogenic succession, Eutrophication.
Identifiers: *Algal growth, Continuous cultures, Batch cultures.

To provide information on algal growth regulators the first phase of this investigation was a continuous flow culture study in which algae were grown under various conditions. When the cultures reached steady state, they were assayed to determine the extent and rate of growth, algal genera present, nutrient utilization, and algal composition. The second phase was a batch culture study which provided means for comparing the two types of cultures (i. e., batch and continuous) and verification of some conclusions of the continuous culture study. Even in sewage effluents containing significant concentrations of both organic and inorganic carbon, algal growth was limited by availability of carbon dioxide. The results indicated that in natural situations where excess carbon dioxide might be available, but nitrogen is deficient in solution, algal succession may occur with shifts to certain blue-green forms containing atmospheric nitrogen fixing capabilities. A previously developed kinetic theory which describes algal growth as being proportional to the cellular concentration of the growth regulating nutrient was confirmed when applied to the carbon dioxide enriched conditions with 10 mg/l ammonia nitrogen in the feed solution. (Jones-Wisconsin)
W72-14790

EUTROPHICATION OF SMALL RESERVOIRS IN THE GREAT PLAINS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
J. Hammer, and L. Hergenrader.
Available from the National Technical Information Service as PB-212 376, $3.00 in paper copy, $0.95 in microfiche. Nebraska Water Resources Research Institute I. Project completion report (1972), 18 p. 3 fig, 2 tab, 3 ref. OWRR A-014-NEB (6).

Descriptors: *Eutrophication, *Reservoirs, *Great Plains, Nebraska, Recreation, Nutrients, Runoff, Photosynthesis, Turbidity, Cyanophyta, Aquatic weed control, Light penetration, Dyes.
Identifiers: Salt Valley (Neb.), Photosynthesis control, Blue dye.

Several small reservoirs were built within a 20 mile radius of Lincoln, Nebraska, for flood control and soil conservation while recreation developed as a secondary benefit. Runoff waters entering the lakes are principally from cultivated farmland. Runoff from intense rains is turbid with suspended silt and clay. In the larger reservoirs, the soil grains settle out of suspension quickly even though the water is stirred by wind; in shallow reservoirs with long reaches in the direction of prevailing winds, the water remains turbid. Eutrophication rates, nutrient sources, and eutrophication control have been examined in five of the reservoirs. Impounded runoff waters have sufficient nutrient salts to support abundant growths of aquatic plants; those reservoirs light-limited by soil turbidity support neither abundant growths of aquatic plants nor dense blue-green algal blooms; clear water reservoirs are very eutrophic--shorelines choked with rooted aquatics, dense blooms of blue-green algae, odorous emissions, and occasional fish kills are typical characteristics. Projections based upon existing data indicate that the useful life of these

reservoirs for body-contact recreation is only a few years. Weed and algae control experiments are being evaluated directed to control photosynthesis by inhibiting sunlight penetration by application of variously colored dyes. (Jones-Wisconsin)
W72-14791

TOXICITY OF KRAFT MILL EFFLUENT TO SELECTED ESTUARINE ORGANISMS FROM YAQUINA BAY, OREGON,
Environmental Protection Agency, Cincinnati, Ohio.
P. Parrish, and F. Horton.
Northwest Sci. Vol. 45, No. 4: p244-251. 1971.
Identifiers: *Water pollution effects, *Pulp wastes, Bays, Cancer magister, Effluents, Embiotoca lateralis, Hexagrammus decagrammus, Parophrys vetulus, Phanerodon furcatus, Platichthys stellatus, *Toxicity, Yaquina Bay (Oregon).

Median tolerance limits of kraft mill effluent were estimated on Phanerodon furcatus, Embiotoca lateralis, Hexagrammus decagrammus, Platichthys stellatus, Parophrys vetulus, and Cancer magister.--Copyright 1972, Biological Abstracts, Inc.
W72-14792

PHYSIOLOGY OF ACIDOPHILIC BACTERIA OF ACID MINE WATER,
Maryland Univ., College Park. Water Resources Research Center.
L. Manning, and M. Cook.
Available from the National Technical Information Service as PB-212 377, $3.00 in paper copy, $0.95 in microfiche. Completion report, February 1972. 50 p. 15 fig, 5 tab, 37 ref. OWRR A-016-MD (2).

Descriptors: *Plant physiology, *Acid bacteria, *Acid mine water, Pseudomonas, Organic acids, Hydrogen ion concentration, Enzymes, Proteins, Water pollution, Cytological studies, Acidic water, Ecology.
Identifiers: *Pseudomonas acidophila sp. n, Pseudomonas fluorescens.

Two new acidophilic bacteria (strains M-1 and M-2) were isolated, characterized, and placed in the genus Pseudomonas, as Pseudonomas acidophila, sp. n. Obligate acidophiles unable to grow at neutrality, they are capable of rapid and vigorous growth at pH 3.5, with a range of pH 2.5-4.5, in an especially devised yeast extract-glucose salts medium. Unlike the ferrobacilli and thiobacilli, they are heterotrophs (that is, use organic compounds for growth) rather than autotrophs. They differ from other acid-tolerant heterotrophic bacteria of such environments in being obligate acidophiles and fail to grow on routine bacteriological culture media. An acidic yeast extract-glucose salts culture medium was developed for heterotrophs such as P. acidophila and an improved iron salts agar medium for the autotrophic iron-oxidizing ferrobacilli. Various morphological and physiological characteristics of the two strains were determined. A low level of yeast extract (0.025-0.050%) stimulates growth, but growth is progressively inhibited above 0.1%. Both inorganic and organic nitrogen sources are utilized for growth. Growth with ammonium salts lowered the pH of the medium but growth with organic nitrogen sources such as L-histidine, hydrolyzed casein or urea consistently raised the pH from an initial value of 4.0 to 5.0 or higher. (Jones-Wisconsin)
W72-14793

GRAZING BY THE CILIATED PROTOZOON LOXODES MAGNUS ON THE ALGA SCENEDEMUS IN A EUTROPHIC POND,
Freshwater Biological Association, Ambleside, (England).
R. Goulder.
Oikos, Vol. 23, No. 1, p. 109-115, 1972. 4 fig., 3 tab., 12 ref.

Descriptors: *Grazing, *Protozoa, *Algae, Scenedesmus, Eutrophication, Ponds, Feeding rates, Benthos, Standing crops.
Identifiers: *Loxodes magnus.

An assessment was made of the importance of grazing by Loxodes magnus, one of a group of benthic ciliated protozoa feeding on Scenedesmus denticulatus, S. quadricauda, and S. acuminatus. The rate at which L. magnus digests Scenedesmus was estimated by means of a laboratory starvation procedure and it was assumed that, under natural conditions, the digestion rate equals the feeding rate. No correlation was found between numbers of L. magnus (and also the ciliate Loxodes striatus) and Scenedesmus crops. Scenedesmus cells per square meter in the sediment decreased from S. quadricauda to S. denticulatus to S. acuminatus but inside L. magnus, numbers of S. denticulatus were highest, decreasing to S. quadricauda and finally S. acuminatus; therefore, L. magnus may be able to distinguish between species of Scenedesmus in its feeding. The population feeding rate of L. magnus represented between 0.003% and 0.68% of the Scenedesmus crop eaten per day; therefore grazing by L. magnus probably had no significant effect. Other ciliates were eating Scenedesmus, and also perhaps benthic rotifers and crustaceans, consequently grazing by all invertebrates could be significant. L. magnus utilizes other food than Scenedesmus--members of this genus are known to feed on both algae and bacteria. (Jones-Wisconsin)
W72-14796

QUANTITATIVE STUDIES ON THE PHYTOPLANKTON OF THE RIVERS THAMES AND KENNET AT READING,
Reading Univ. (England). Dept. of Zoology.
T. J. Lack.
Freshwater Biology, Vol. 1, p. 213-224, 1971. 2 fig., 2 tab., 22 ref.

Descriptors: *Algae, *Phytoplankton, *Rivers, *Diatoms, Chlorophyta, Benthic flora, Eutrophication, Dominant organisms, Biological communities, Nutrients, Scenedesmus, Chrysophyta, Seasonal, Silica, Discharge (Water).
Identifiers: *Centric diatoms, *River Thames (England), River Kennet (England), Stephanodiscus hantzschii, Cryptomonas, Rhodomonas.

Seasonal changes in density and species composition of River Thames phytoplankton and its tributary, River Kennet, at Reading (England) were studied. Observations extended from May 1966 to May 1968. Samples consisting of 250 ml of subsurface water were taken weekly from the center of each river approximately 200 m upstream of the confluence. These were concentrated by sedimentation and counted in a haemocytometer. Data on discharge, temperature, and silica concentration are followed by descriptions of the variations in number and phytoplankton composition. In both rivers there were spring and autumn peaks of the centric diatom, Stephanodiscus hantzschii. Chlorophyceae were most abundant during summer. Two cryptophyceans, Cryptomonas and Rhodomonas, were sometimes numerous. In the Thames, population size was closely correlated with the discharge, highest numbers always occurring during low discharge periods. In the Kennet, increases in discharge often brought about increases in cell number due to influx of benthic forms. It seems highly probable that the rivers maintain high levels of nitrates and phosphates since both carry considerable quantities of treated sewage effluent. Comparisons with earlier studies on the Thames showed difference in phytoplankton composition which were almost certainly due to eutrophication. (Jones-Wisconsin)
W72-14797

THE INFLUENCE OF VARIOUS CONCENTRATIONS OF NATURAL FOOD ON THE DEVELOPMENT, FECUNDITY AND PRODUCTION OF PLANKTONIC CRUSTACEAN FILTRATORS,
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.

Ekologia Polska, Vol. 19, No. 30, p. 427-473, 1971. 15 fig., 16 tab., 100 ref.

Descriptors: *Fecundity, *Productivity, *Plankton, *Crustaceans, Foods, Daphnia, Life history studies, Zooplankton, Thermal properties, Trophic level, Growth rates, Reproduction, Eutrophication, Biomass, On-site investigations, Temperature.
Identifiers: Daphnia cucullata, Daphnia longispina, Diaphanosoma brachyurum, Chydorus sphaericus, Eudiaptomus graciloides, Mikolajskie Lake (Poland).

Planktonic crustacean filtrators are an important link in production of freshwater ecosystems. As primary consumers, directly utilizing primary production, they largely decide the character of the energy flow through the ecosystem. The relation of natural food concentration to the development, growth, and fecundity rates of these filtrators, which dominate the pelagic area of Mikolajskie Lake, Poland was studied. The production of zooplankton communities under various thermal and trophic conditions was calculated. Two basic problems are solved: is the food available for planktonic crustacean filtrators sufficient for optimal development and growth, and how the fluctuations of food abundance in nature can influence production in Mikolajskie Lake, a typical eutrophic lake in a temperate climate. The results show that the food concentration available is as important a factor for development, growth and production of planktonic filtrators as temperature. A positive dependence of the length and rate of development on a trophic factor was found for all investigated species in may food concentrations. Quantity of food available for planktonic filtrators in the eutrophic lake can be a limiting factor for development and production of individuals. The limiting factor of food varies for different species utilizing different food. (Jones-Wisconsin)
W72-14799

LIGHT-INDUCED FLUORESCENCE CHANGES IN CHLORELLA, AND THE PRIMARY PHOTOREACTIONS FOR THE PRODUCTION OF OXYGEN.
Rockefeller Univ., New York.
D. Mauzerall.
Proceedings of the National Academy of Sciences, Vol 69, No 6, p 1358-1362, 1972. 3 fig, 27 ref.

Descriptors: *Algae, *Fluorescence, *Chlorella, *Photoactivation, *Oxygen, Light, Photosynthesis, Optical properties, Absorption, Mathematical studies, Chlorophyll, Oxidation reduction potential.
Identifiers: Chlorella vulgaris.

The increase of the quantum fluorescence yield in green plants and algae with increasing illumination has long been an indicator of the state of the photoreactive centers in photosynthesis. There are different parts of this nonlinear fluorescence; some parts are fairly slow (seconds to minutes); others are fast (milliseconds). The light-induced increases of the effective fluorescence yield in Chlorella are too slow to be a primary process in photosynthesis. The fast transient state is attributed to a priming reaction for the photosystem that makes oxygen. The slower cyclical process is attributed to the dark reactions that make oxygen after photoexcitation of this system. The slower cyclical process is also distinguished by a narrower emission spectrum that peaks at a shorter wavelength than the dark adapted or fast transient state. A minimum of six different fluorescent

states are required to explain the data. In addition to the usual assumption about changing quantum yield of fluorescence in these processes, the data suggest that changes in cross section of optical absorption must also be considered. The slowest relaxation times observed are well correlated with the slow steps detected in evolution of oxygen. (Jones-Wisconsin)
W72-14800

EXPERIMENTAL INVESTIGATIONS ON THE ACTIVITY OF BACTERIA IN RELATION TO THE METABOLISM OF NITROGEN COMPOUNDS IN GRAVEL-PIT LAKES (EXPERIMENTELLE UNTERSUCHUNGEN UEBER DIE AKTIVITAET VON BARTERIEN BEIM VMSATZ VON N-V ERBINDUNGEN IN BAGGERSEEN),
Landesstelle Gewaesserkunde, Baden-Wuerttemberg (West Germany); and Slovenska Akademie Vied, Bratislava (Czechoslovakia). Limnobiologisches Institut.
R. Ritter, I. Daubner, and W. Schmitz.
Archiv fur Hydrobiologie, Vol 69, No 3, p 294-308, 1971. 10 fig, 5 tab, 9 ref. English summary.

Descriptors: *Nitrogen cycle, *Bacteria, *Metabolism, Ammonia, Nitrites, Nitrates, Oxygen, Ammonification, Aerobic conditions, Anaerobic conditions, Nitrification, Denitrification.
Identifiers: Gravel-pit lakes, Upper Rhine Valley.

The part which physiological groups of bacteria play in the nitrogen cycle in gravel-pit lakes of the Upper Rhine Valley was investigated by experimental methods. Metabolic potential was studied by estimating activity of ammonifying, nitrifying, and denitrifying bacteria in water samples after addition of corresponding specific nutrients. The metabolic rate was determined by estimating nitrogen compounds concentration changes in natural or specially prepared water samples with oxygen content controlled as a function of time. Ammonifying and nitrifying potential were maximum during early September, while the nitrifying potential was maximum during fall. Ammonifying and nitrifying potentials are not dependent on water oxygen content although higher potentials occur in the hypolimnion than in epilimnion. Influence of oxygen content is greater on denitrifying and nitrifying potentials. During incubation, concentration changes of nitrogen compounds in water samples occur in two phases, depending on oxygen; during the first aerobic phase, ammonia concentrations decrease, while nitrite and nitrate increase; during the following anaerobic phase, the nitrate content decreases, but nitrite and ammonia increase. In other experiments, the first phase is similar, but during the second, at lower oxygen concentrations, ammonia as nitrate decreases while nitrite increases slightly. (Jones-Wisconsin)
W72-14802

A STUDY OF NITRIFICATION IN FORT LOUDOUN RESERVOIR,
Tennessee Univ., Knoxville. Water Resources Research Center.
W. B. Bondurant.
Report No. 13. MS thesis, March 1972. 74 p, 20 fig, 12 tab, 57 ref, 3 append. OWRR A-013-TENN (3). 1431-0001-3243.

Descriptors: *Nitrification, *Reservoirs, *Tennessee, Computer models, Ammonia, Nitrates, Nitrites, Nitrogen, Dissolved oxygen, Fluorescent dye, Oxidation, Temperature, Biochemical oxygen demand, Computer programs, Curves, Model studies, Bacteria, Fungi, Actinomycetes, Inhibitors, Biochemistry, Hydrogen ion concentration, Methodology.
Identifiers: *Fort Loudoun Reservoir (Tenn), Nitrosomonas, Nitrobacter.

Changes in nitrogen forms as water moves through Fort Loudoun Reservoir, Tennessee are investigated and a field test made of applicability of a model predicting changes with time in ammonia nitrogen, nitrite nitrogen, and nitrate nitrogen concentration, and rate of oxygen uptake at different times. Slugs of water were tagged with fluorescent dye and samples were taken from the tagged sediments. Ammonia nitrogen, nitrite nitrogen, and nitrate nitrogen concentrations were determined on each sample. A tracer was necessary because of unsteady flow conditions resulting from power dams above and below the reservoir. The nitrogen concentrations were plotted against time and the rates of nitrification were determined graphically. Input was determined for the computer prediction model, and the predicted nitrogen versus time curves were compared with the actual curves. In all, four studies were conducted--one during nonstratified conditions and three during stratified conditions. Although agreement between actual and predicted oxidation was not exact, no indication could be found that biological or chemical factors caused the disagreement. The prediction model as proposed serves as an adequate description of the nitrification processes that occur in polluted waters. (Jones-Wisconsin)
W72-14803

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF POLYCHLORINATED BIPHENYLS,
National Institute of Environmental Health Sciences, Research Triangle Park, N.C.
L. Fishbein.
Journal of Chromatography, Vol 68, p 345-426, 1972. 8 fig, 37 tab, 113 ref.

Descriptors: *Polychlorinated biphenyls, *Chromatography, *Analytical techniques, Ecological distribution, Toxicity, Pesticides, Chlorinated hydrocarbon pesticides, Mass spectrometry, Pollutant identification, Aroclors, Lethal limit, Pathology, Pesticide residues, DDT, DDD, DDE.
Identifiers: *Pesticide analysis, Chlorinated napthalines, Organochlorine pesticides, Dibenzofurans.

Information relative to the biological decomposition of polychlorinated biphenyls is scant. They are more stable than DDT and its metabolites since the PCBs lack the ethane component between the aromatic rings. This factor coupled with their physical and chemical characteristics for persistence indicates that these materials are capable of biological magnification up the food chain. Their high lipid solubility results in accumulation in fatty tissues of lower animals and marine life. Because of very low aqueous solubility, they accumulate on underwater sediments in relatively high concentration and redissolve very slowly. In describing effects and interactions of environmental chemicals (aspirin, caffeine, Aroclor 1254, carbaryl, parathion, DDT, and several insecticide metabolites) on human cells in tissue culture, aspirin and caffeine were 8 to 20 times less toxic than the other agents studied while the PCB plasticizer Aroclor 1254 was as toxic as DDT. The chromatographic (column, thin-layer and gas-liquid and combined gas-liquid chromatography and mass spectros copy) and biological aspects of the polychlorinated biphenyls are reviewed with primary focus as to their utility, ecological distribution and toxicity as well as diverse techniques for their separation from chlorinated pesticides and subsequent analysis. (Jones-Wisconsin)
W72-14804

SOME DATA ON THE ROLE OF FOOD IN THE BIOLOGY OF EUDIAPTOMUS ZACHARIASI POPPE,
Instytut Rybactwa Srodladowego, Warsaw (Poland).
E. Grygierek.
Ekologia Polska, Vol 19, No 21, p 277-292, 1971. 8 fig, 38 ref.

Descriptors: *Crustaceans, *Foods, *Life history studies, Copepods, Diatoms, Chlorophyta, Temperature, Size, Fecundity, Algae.
Identifiers: *Eudiaptomus zachariasi.

The role of food in the development of the crustacean, Eudiaptomus zachariasi, in a natural habitat was studied. By daily sampling from six similar fry ponds, examination was made of the relation between duration of development, size, and fecundity and the amount of its food. Analysis was made of total abundance, of variation in age and sex structure, in length of individuals at different stages of development, abundance of eggs and numbers of females with eggs. Eudiaptomus zachariasi fed on rotifers, but when there were few rotifers, its food was algae, measuring up to 50 microns, more difficult to digest than rotifers. The development cycle of the generation of E. zachariasi hatched from resting eggs lasted from 13 to 23 days, as did that of the next generation. Differences were not greater than a few days and might have been caused by amount of food during development period of the generation. In extreme cases the food level limits the number of generations. The size of individuals, sex structure and particularly individual fecundity of E. zachariasi depended on amount of food. Individual fecundity did not always determine the fecundity of the whole population. (Jones-Wisconsin)
W72-14805

THE DEPENDENCE OF PRIMARY PRODUCTION UPON PHYSICAL AND CHEMICAL FACTORS IN A SMALL, SENESCING LAKE, INCLUDING THE EFFECTS OF COMPLETE WINTER OXYGEN DEPLETION,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.; and North Dakota State Univ., Fargo.
D. W. Schindler, and G. W. Comita.
Archiv fur Hydrobiologie, Vol 49, No 4, p 413-451, 1972. 17 fig, 8 tab, 17 ref.

Descriptors: *Anaerobic conditions, *Primary productivity, *Chemical properties, *Physical properties, Lakes, Eutrophication, Oxygen, Ice cover, Winter, Phytoplankton, Minnesota, Standing crops, Biota, Productivity, Regression analysis, Thermal stratification, Chlorophyll, Cyanophyta, Diatoms, Daphnia, Nutrients, Sediments, Hydrogen sulfide, Temperature, Zooplankton, Fishkill, Turbidity.
Identifiers: *Oxygen depletion, Severson Lake (Minn).

Limnological observations with measurements of water chemistry, primary production and phytoplankton, were made in small eutrophic Severson Lake, Minnesota for several years. Detailed information was obtained in 1955 and in 1964-65. Light penetration was reduced by bluegreen algal blooms in 1955. Primary production/standing crop was low. There were large bluegreen blooms in the fall of 1964, production exceeding those in 1955. In May after a winter when oxygen depletion caused complete fish kills, diatom and green flagellates appeared. They were quickly grazed by Daphnia pulex which appeared for the first time, displacing D. parvule completely and Diaptomus siciloides partially. In June 1965, very low phytoplankton standing crops and production, but no Cyanophyta, accompanied by high transparency, caused increased aquatic macrophyte growth. Chlorophyll, temperature, dissolved inorganic nitrogen and incident solar radiation were shown by multiple regression analysis to be the most important causes of productivity in 1964-65. Chlorophyll, temperature, and light explained much of the variance in 1955 production. Some hypotheses are suggested to explain changes in terms of chemical and physical parameters, particularly those occurring under winter ice. (Jones-Wisconsin)
W72-14806

RELATIVE TOLERANCE OF NITROGEN-FIXING BLUE-GREEN ALGAE TO PESTICIDES,
Indian Agricultural Research Inst., New Delhi.
G. S. Venkataraman, and B. Rajyalakshmi.
Indian Journal of Agricultural Sciences, Vol 42, No 2, p 119-121, 1972. 1 tab, 11 ref.

Descriptors: *Algae, *Cyanophyta, *Pesticides, Fungicides, Herbicides, Irrigation, Agriculture, Rice, Crop response.
Identifiers: *Tolerance, Anabaena, Nostoc, Aulosira, Tolypothrix, Anacystis nidulans.

In-vitro tolerance of blue-green algae to pesticides was studied. Twenty-seven strains of nitrogen-fixing Cyanophyta from four genera were tested. Commercial preparations of ceresan M, dithane, 2,4-D, delapon, propazine, cotoron, diuron, and linuron were used at concentrations varying from 0.01 to 2000 ppm. Most nitrogen-fixing blue-green algae could tolerate high pesticide levels although they showed wide variation in relative tolerance. Levels of different pesticides are described in relation to specific strains; for example, though most of the strains of Anabaena could tolerate 100 ppm of ceresan, strain 310 was sensitive to a concentration of 0.01 ppm; though dithane was lethal to some strains of Anabaena and Nostoc at the lowest concentration used, some strains could grow well at 50 ppm. High concentrations of ceresan, dithane, 2,4-D and delapon were tolerated by Tolypothrix tenuis and Aulosira fertilissima. Propazine, cotoron, and linuron were lethal, and diuron lethal to both algae. Specific strains should be used with different pesticides and a mixture of different strains--not a single strain--should be used as seeding material when more than one pesticide is applied to the crop. (Jones-Wisconsin)
W72-14807

OBSERVATIONS ON THE CYTOLOGY AND ULTRASTRUCTURE OF THE NEW ALGAL CLASS, EUSTIGMATOPHYCEAE,
Leeds Univ. (England). Dept. of Botany.
D. J. Hibberd, and G. F. Leedale.
Annals of Botany, Vol 36, p 49-71, 1972. 2 fig, 7 plates, 65 ref.

Descriptors: *Cytological studies, *Systematics, *Algae, Chrysophyta, Phaeophyta.
Identifiers: *Eustigmatophyceae, Xanthophyceae, Polyedriella helvetica, Pleurochloris commutata, Pleurochloris magna, Vischeria punctata, Vischeria stellata, Ellipsoidion acuminatum.

The first detailed account of a new class of algae, Eustigmatophyceae is given. Its unique features are emphasized in comparison with those coccoid forms which must be considered as members of the Xanthophyceae sensu stricto. The zoospores, and to a lesser extent, the vegetative cells of six species of Eustigmatophyceae species were studied with light and electron microscopy. The features of organization are compared in detail with the same components in the Xanthophyceae and other classes of algae, with particular reference to the motile cells. It is concluded that Eustigmatophyceae is less like the Xanthophyceae sensu stricto than the latter is like the Chrysophyceae and Phaeophyceae, and in most characteristics shows fundamental differences from all other classes of algae. The taxonomic difficulty raised by eustigmatophycean possession of an anterior hairy flagellum of typically 'heterokont' construction is discussed. The taxonomic and nomenclatural problems resulting from the removal of several species from the Xanthophyceae into the Eustigmatophyceae are briefly considered and previous observations by other authors on species now placed in the Eustigmatophyceae are reviewed. (Jones-Wisconsin)
W72-14808

EFFECT OF TEMPERATURE AND AERATION ON THE SURVIVAL AND GROWTH OF SALMONELLA TYPHIMURIUM IN DAIRY WASTE,
Auburn Univ., Ala.
M. A. Jaleel.
MS thesis, March 1972. 78 p, 6 fig, 3 tab, 171 ref, append. OWRR B-017-ALA (1).

Descriptors: *Salmonella, *Temperature, *Aeration, *Mortality, Dairy industry, Period of growth, Wastes, Coliforms, Pathogenic bacteria, Epidemiology, Cattle, Isolation, Separation techniques, Human diseases, Animal diseases, Carriers, Water pollution, Sampling, Cultures, Hydrogen ion concentration, Oxidation-reduction potential, Farm wastes.
Identifiers: *Salmonella typhimurium, *Dairy wastes, Salmonella survival, Detection procedure.

Dissemination of Salmonella typhimurium by dairy cattle leading to water contamination prompted study of the viability of this bacterium in liquid bovine waste. Salmonella detection and enumeration procedure of Cheng, et al. was modified by concentrating the enrichment medium rather than the inoculum. Confirmation of Salmonella was accomplished by inoculating the suspected colonies from brilliant green agar into triple sugar iron agar. Serological confirmation was done by using polyvalent O antiserum. Results showed that S. typhimurium survived longer (mean survival time 44.4 days) at 10C as compared to 3.4 days at 35C. A 99% kill of S. typhimurium in the aerated sample at 10C was much faster (18-21 days) when compared to the 99% kill in the nonaerated sample at 10C (28-35 days). Mean survival time in aerated dairy waste at 35C was much longer (16 days) than the mean survival time in the nonaerated sample (3.4 days). A 99% reduction of Salmonella in aerated waste occurred during 12-18 days of incubation whereas in nonaerated waste 99% reduction occurred between 3 and 6 days of incubation. (Jones-Wisconsin)
W72-14809

MICROBIOLOGICAL STUDIES ON NITROGEN FIXATION IN AQUATIC ENVIRONMENTS--III. ON THE NITROGEN FIXING BACTERIA IN OFFSHORE REGIONS,
Kyoto Univ. (Japan). Research Inst. for Food Science; and Mie Prefectural Univ., Tsu (Japan).
A. Kawai, and I. Sugahara.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 37, No 10, p 981-985, 1971. 2 fig, 3 tab, 4 ref.

Descriptors: *Nitrogen fixation, *Nitrogen fixing bacteria, *Oceans, Bottom sediments, Standing crops, Surface waters, Pacific Ocean.
Identifiers: Japan Sea, Suruga Bay (Japan), Sagami Bay (Japan), East China Sea.

The number of nitrogen fixing bacteria was counted in the open waters of the mid-Pacific Ocean and Japan Sea and in the bottom sediments of some sea water environments. The standing crop of nitrogen fixing bacteria was quite small in the surface waters of the mid-Pacific Ocean and the Japan Sea, that is, at most 200 cells/l and 400 cells/l, respectively. Nitrogen fixing bacteria occur more abundantly in the bottom sediments than in the water, namely 1-10 cells/l g of wet mud in offshore regions and open seas such as Suruga Bay, Sagami Bay, and the East China Sea. In general, nitrogen fixing bacteria in offshore or open sea water are extremely scanty compared with those in inland bays. According to these results, it seemed likely that the nitrogen fixation in an open sea may be carried out mainly in the water column rather than in the bottom mud in respect to the bulk of water mass, even though the standing crop of nitrogen fixing bacteria in 1 g of wet mud is considerably larger than that in 1 ml of water. (Jones-Wisconsin)
W72-14810

THE INFLUENCE OF EXPERIMENTAL INCREASE OF BIOMASS OF THE BLUE-GREEN ALGAE GLOEOTRICHIA ECHINULATA (SMITH) RICHTER ON PHYTOPLANKTON PRODUCTION,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
I. Spodniewska.
Ekologia Polska, Vol 19, No 31, p 476-483, 1971. 2 fig, 5 tab, 4 ref.

Descriptors: *Algae, *Biomass, *Cyanophyta, Phytoplankton, Productivity, Photosynthesis, Epilimnion, Light intensity, Respiration, Limiting factors.
Identifiers: *Gloeotrichia echinulata, Mikolajskie Lake (Poland), Ceratium hirundinella.

Investigations in Mikolajskie Lake, Poland were made of the possibilities of increasing phytoplankton production in particular trophic conditions by increasing biomass of the planktonic blue-green alga Gloeotrichia echinulata and of the estimation of net production of this species in natural conditions. This species was chosen because of the good possibility of isolating it from other phytoplankton. Surface water plankton was condensed and colonies separated. Primary production was estimated. Of three experimental series, the first and second were just under the water surface, and the third at various depths of the trophogenic layer (0-6 m). Phytoplankton production of an unchanged biomass was compared with phytoplankton production to which a known number of colonies of G. echinulata was added. Production was then calculated from the difference. In each one of the experimental series, independent of the period they were carried out, and thus independent of the possible existence of differences in physiological algal properties and/or in environmental conditions at the time, it was found that production increases as a result of an increase of phytoplankton density due to addition of G. echinulata colonies. (Jones-Wisconsin)
W72-14812

FLUORIDE CHLORINITY RATIOS IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
For primary bibliographic entry see Field 02L.
W72-14813

EFFECTS OF CERTAIN PARAMETERS ON BACTERIAL POLLUTION AT A COASTAL SITE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-14817

THE PRODUCTIVITY OF ATTACHED ALGAE IN RIVER, (IN JAPANESE),
Research Inst. for Natural Resources, Tokyo (Japan).
Tokio Okino.
Mis Rep Res Inst Nat Resour. 74. p 72-79. 1970. English summary.
Identifiers: *Algae, Biomass, Flow rates, Photosynthesis, *Productivity, Rivers, Streams.

The relation between the population increase of attached algae and water flow was discussed from experiments using artificial streams. One artificial stream was set in a constant temperature room and the other was outdoors. The stream length and the velocity of flow of the former were 3 m and 3.3 cm/sec, respectively, and those of the latter were 31 m and 16 cm/sec. Glass slides (7.5 x 2.5 cm2) were used as the artificial substrate for attached algae. The increase of the biomass on artificial substrates was faster in the high velocity flow. The rate of photosynthesis per unit area increased at the beginning and attained a constant rate in running water, while the rate in still water

decreased gradually from the beginning. The increase of the amounts of chlorophyll/100 hr at the beginning was about 200 mg chlorophyll (a + b) m2 for 16 cm/sec flow, 50 mg for 3.3 cm/sec flow, and 20 mg in still water. The increase of the biomass in running water may indicate photosynthesis of attached algae is accelerated by flow.--Copyright 1972, Biological Abstracts, Inc.
W72-14821

PRIMARY PRODUCTION IN THE BAIE-DES-CHALEURS (SAINT-LAWRENCE GULF),
Station Zoologique, Villefranche-sur-Mer (France).
L. Legendre.
Nat Cn. Vol 98, No 5, p 743-773. 1971. Illus. Map. English summary.
Identifiers: *Primary productivity, Baie-Des-Chaleurs, Canada, Gulfs, *Gulf of St. Lawrence.

Evidence from 2 series of summer hydrographic observations gives support to the existence of an upwelling zone, in the center of the intermediate area of Baie-des-Chaleurs. The production system of the bay is influenced by the upwelling through its effect on the vertical distribution of nutrients. Nutrient-rich water of Baie-des-Chaleurs yields high primary production and summer averages near 1 g C/m2/day are reached; the factor accounting for the largest fraction of the variance in primary production is chlorophyll a.--Copyright 1972, Biological Abstracts, Inc.
W72-14823

THE TOXICITY OF MICROCYSTIS AERUGINOSA KUTZ FROM SOME ENGLISH RESERVOIRS,
Freshwater Biological Association, Ambleside (England).
S. I. Heaney.
Water Treat Exam. Vol 20, No 4, p 235-244. 1971. Illus.
Identifiers: Public health, Mice, *Microcystis aeruginosa, Reservoirs, *Toxicity.

In 1968, 1969 and 1970 some of the reservoirs belonging to the Metropolital Water Board of Northern Ireland produced dense growths of M. aeruginosa, a feature which has been of common occurrence for at least 60 yr. Results of an investigation into the toxicity of some of these waterblooms to mice are presented and discussed in relation to its toxicity in nature and humans.--Copyright 1972, Biological Abstracts, Inc.
W72-14824

HYDROBIOLOGY OF SOUTHEASTERN LAKES: PHYSICOCHEMICAL CHARACTERISTICS OF THE WATERS,
Bordeaux Univ. (France). Lab. of Botany.
R. Baudrimont.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). Vol 273, No 18, p 1567-1569. 1971.
Identifiers: Algae, France, Hydrobiology, *Lakes, Myriophyllum D, Nymphaea D, Phragmites M, *Chemical properties, Potamogeton M, Scirpus M, Organic matter, Sphagnum.

A study of a series of lakes in southeastern France showed that their waters are homoiohalines, slightly acid and well oxygenated. In the shore areas populated by Sphagnum, the pH was definitely acid (5-5.5). In the areas populated by Myriophyllum and Potamogeton, the 02 content of the water amounted to 14 mg/l. The amount of organic matter in the water varied from 2 to 10.5 mg/l; high concentrations were found during the proliferation of algae and at the time of the destruction of Phragmites, Scirpus, Myriophyllum, Potamogeton and Nymphaea.--Copyright 1972, Biological Abstracts, Inc.
W72-14825

HYDROBIOLOGICAL EVALUATION OF THE SEPETIBA BAY,
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil). Div. of Zoology.
Lejeune P. H. Oliveira.
Mem Inst Oswaldo Cruz (Rio De J). Vol 69, No 1, p 1-31. 1971. Illus. Map. English summary.
Identifiers: Algae, Bays, Brazil, Hydrobiology, Penaeus schmidti, *Water pollution, *Sepetiba Bay (Brazil).

Physical, chemical and biological characteristics of Sepetiba Bay, Rio de Janeiro, Brazil are given. Coloration of the water due to algal blooms, notes on the shrimp Penaeus schmidti and pollution of the bay are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-14826

A PRE-IMPOUNDMENT STUDY OF THE NORTH ANNA RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W72-14846

CHARACTERISTICS OF YEASTS ISOLATED FROM PHENOL- AND CATECHOL-ADAPTED ACTIVATED SLUDGE,
Indian Inst. of Science, Bangalore. Microbiology and Pharmacology Lab.
For primary bibliographic entry see Field 05D.
W72-14860

STUDIES ALONG THE EDGE OF A LICHEN DESERT,
Sheffield Univ. (England). Dept. of Landscape Architecture.
O. L. Gilbert.
Lichenologist (Oxf). Vol 5, No 1/2, p 11-17. 1971. Illus.

Descriptors: *Air pollution, Desert, England, *Lichens, Parmelia saxatilis, Sulfur.

In 1964, a coal-fired power station was completed at Blyth on the Northumberland coast, just within the 600 miParmelia saxatilis desert which covers the Northumberland and Durham Coalfield. It was expected that there would be an increase in SO2, and therefore chart quadrats were prepared at 13 places in the Blyth area and 4 controls set up in a climatically similar area near Belsay, 21 km (13 mi) to the northwest. In the 6 yr period a great reduction in the cover of P. saxatilis was particularly noticeable. Many apparently well established and healthy colonies disappeared between mappings. As colonies become affected, they take on a highly characteristic crescent-shaped appearance. No new colonies appeared during the 6 yr of observation. The only growth observed was some radial increase of margins. Numerous transverse sections of thallus lobes were prepared and compared with material from the control sites. The chief difference was that the P. saxatilis from the edge of the desert showed an orange coloration, which might be associated with the decomposition of a lichen acid. An anomalous population of P. saxatilis was discovered deep in the coalfield area, which showed a healthy growth pattern and no reddish coloration. It seems likely that this population represents an ecotype possessing enhanced resistance to SO2. Although a well-defined set of symptoms can be detected in wall-top populations of P. saxatilis subject to levels of air pollution of about 50-120 micro g/SO2/m3, the mechanism of the SO2 toxicity is probably complex and inexplicable in terms of a single factor.--Copyright 1972, Biological Abstracts, Inc.
W72-14873

NEW BIOLOGICAL AGENT FOR NATURAL SELF-PURIFICATION OF SURFACE WATERS,
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 05G.
W72-14904

FOUR PROBLEM AREAS,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
G. A. Swanson.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 141-151.

Descriptors: *Environment, *Population, Technology, *Quality control, *Management, Rural areas, Eutrophication, Pesticides, Strip mines, Research and development, Regulation, Education, *New York, Maine.
Identifiers: Broome County (N.Y.), Lake George (N.Y.), Sebago Lake (Maine).

Concern for the environment stems from two main causes: increasing numbers of people and increasing capability of technology to modify the environment. Four problem areas in environmental quality control are: (1) rural living, (2) cultural eutrophication of water, (3) pesticides, and (4) strip mining, especially for oil shale. A study conducted by Broome County, New York which investigated the various aspects of its rural population is discussed. Eutrophication has been hastened by greatly increased erosion and siltation, particularly by the inflow of nutrients from runoff of agricultural lands and the inflow of both treated and untreated sewage. An important problem for managing the quality of the aquatic environment is to develop methods of municipal sewage treatment which will remove the nitrates and phosphates efficiently. Two examples of adverse effects of pesticides on fishes are: Lake George, New York and Sebago Lake, Maine. There is a need for research and regulation which will eliminate the persistent wide spectrum of pesticides. There has been little research which estimates the effects of oil shale mining on the environment. Whereas the first example requires public education, the other three examples demand further research, public education, and government regulation. (Strachan-Chicago)
W72-14908

5D. Waste Treatment Processes

SEWAGE-POLLUTION PREVENTION.

Mich. Public Acts No. 33 (1971).

Descriptors: *Michigan, *Legislation, *Grants, *Treatment facilities, Government finance, Pollution abatement, Financing, Water pollution control, Legal aspects, Water law, Sewage treatment, Regulation, Sewage, Sewage disposal, Local governments, Administration.
Identifiers: *Michigan Sewage Treatment Law.

The amendment to Michigan's sewage treatment law designates the proportions and limits of financial assistance local agencies may receive from state and federal sources for the construction of treatment works to prevent discharges of inadequately treated sewage or other liquid wastes into any waters of the state. Financial assistance shall be given to a local agency only if it is eligible for federal funds; if construction contracts were awarded or construction commenced after June 30, 1967; and if the local agency has agreed to adjust the amount of its request for federal grants to the amount that is determined by the water resources commission to be available for apportionment. The Water Resources Commission shall establish a priority list of eligible projects to be approved by the state legislature. This list is

designated as the priority list from which projects shall be certified to the administering federal agency for federal grants. Prerequisites to priority certification by both the state agency and the federal agency are listed. A point total is assigned to each application timely filed in conformity to this Act and the requirements of the federal agency. (Brackins-Florida)
W72-14254

VERMONT WHEY POLLUTION ABATEMENT AUTHORITY LAW.
For primary bibliographic entry see Field 05G.
W72-14255

WATER SUPPLY AND WASTE DISPOSAL SERIES: VOLUME I. TERMINOLOGY STANDARDIZATION AND MICROBIOLOGY.
Federal Highway Administration, Washington, DC, Office of Research; and Federal Highway Administration, Washington, D.C. Office of Development.
For primary bibliographic entry see Field 05B.
W72-14363

A COST ANALYSIS OF WASTE MANAGEMENT IN THE STEEL INDUSTRY,
Rand Corp., Santa Monica, Calif.
D. P. Tihansky.
Available from the National Technical Information Service as AD-742 381, $3.00 in paper copy, $0.95 in microfiche. January 1972, 18 p., 7 tab, 18 ref.

Descriptors: *Cost analysis, *Waste water treatment, *Capital costs, *Operating costs, Steel, Cost comparison, Air pollution, Total costs, Pollution abatement, Liquid wastes.
Identifiers: *Steel industry, Departmental costs, Process costs.

A cost analysis of waste management in the steel industry was presented. It was reported that during a 20 year period starting in 1951 steel corporations in the United States have committed almost $1 billion to water and air pollution abatement facilities with 55% of this amount being spent on water quality improvement. Annual operating costs for liquid and gaseous waste reduction were comparable in magnitude, each totalling $30 million. Capital and operating costs by department for a specific steel company were presented in tabular form. For the period 1951-1967 capital costs for water pollution abatement totalled $3,815,000, and operating costs totalled $452,000 during 1965. Also, the cost of rolling mill scale treatment, with annual scale loads of approximately 15,000 tons and the cost of by-product coke plant waste treatment, with annual effluent loads of 565 million gallons were presented in tabular form. (Galwardi-Texas)
W72-14379

MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM, WASTEWATER COLLECTION, TREATMENT AND DISPOSAL.
Humboldt County Planning Commission, Eureka, Calif.; and Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Information Service as COM-72-10417, $6.00 in paper copy, $0.95 in microfiche. July 1971, 217 p., 60 fig, 48 tab.

Descriptors: *Planning, *Waste water disposal, *Waste water treatment, *Treatment facilities, Regional analysis, *Costs, Financial analysis, Reclaimed water, Pulp and paper industry, *California, Pollution abatement.
Identifiers: Regional planning, Urban planning, Economic development, Waste water collection, *Humboldt County (Calif).

The need for a study of wastewater collection, treatment, and disposal facilities in the western mid-portion of Humboldt County, California, and long-range plans for development of such facilities were described. Plans were broken down by service areas and included financing and cost data. Alternative plans explored pros and cons of consolidation of wastewater treatment facilities and recommended total consolidation in 1985. Plans for individual service area collection systems were recommended. Also, it was recommended that tow pulp mills on the Samoa Peninsula study possible use of treated wastewater as a supplemental water source. (Galwardi-Texas)
W72-14380

ADSORPTION OF F2 BACTERIOPHAGE BY ACTIVATED CARBON AND ION EXCHANGE RESINS,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
J. T. Watson, and W. A. Drewry.
Available from Univ. of Tennessee, Knoxville, Dept. of Civil Engineering, for $3.00 per copy. Research Series No 11, and Tennessee Water Resources Research Center Report No 14, August 1971. 221 p, 16 fig, 78 tab, 51 ref, 1 append. OWRR A-018-TENN (2).

Descriptors: *Viruses, *Activated carbon, *Ion exchange, *Tertiary treatment, *Bacteriophage, Flow rates, Mathematical models, Performance, Weight, Height, *Waste water treatment.
Identifiers: *f2 Bacteriophage, Amberlite IRA-402, Amberlite IR-122, Column height, River water, Waste water treatment effluent.

Two activated carbons and two ion exchange resins were utilized to determine the degree to which the f2 bacteriophage were adsorbed by the media. The activated carbons were Pittsburgh (8 x 30 mesh) and West Virginia Nuchar C-190 (plus 30 mesh). The ion exchange resins used were an anion resin, Amberlite IRA-402, and a cation resin, Amberlite IR-122. The results of the study revealed that both of the activated carbons and the anion resin definitely have the capability to adsorb virus particles from water. The cation resin, Amberlite IR-122, was not effective as a virus adsorbent during any of the tests. The batch tests revealed that the virus removal could be described by first-order equations. West Virginia Nuchar C-190 was found to be the most effective adsorbent in both the batch tests and the column experiments when compared on a weight basis. However, the Amberlite IRA-402 resin achieved the best virus removals in both test waters when the same depth of adsorbents was used in the column runs. This removal was in excess of 99.9% in both test waters using a flow rate of 0.5 gpm/sq. ft. (Galwardi-Texas)
W72-14381

REST AREA WASTEWATER DISPOSAL,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. O. Sylvester, and R. W. Seabloom.
Available from the National Technical Information Service as PB-208 522, $3.00 in paper copy, $0.95 in microfiche. January 1972. 72 p, 10 fig, 16 tab, 20 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage disposal, Lagoons, Septic tanks, *Waste water disposal.
Identifiers: Highway rest areas, *Toilet systems (Recirculating).

The development of alternative methods of wastewater disposal in Highway Department Safety Rest Areas was investigated. Existing and planned rest area installations were studied to establish critical operating parameters and relative effectiveness of existing waste disposal systems. State-of-the-art systems and various additives were examined and tested to determine if system efficiency can be increased. Recommendations were made as to disposal systems which were suited to the conditions existing in rest areas including the desirable and undesirable features of each system considered. (Galwardi-Texas)
W72-14382

SANITARY WASTE WATER TREATMENT AND DISPOSAL AS RELATED TO DEVELOPMENT--LAKE COUNTY, FLORIDA.
Florida Dept. of Community Affairs, Tallahassee. Technical Assistance Div.

Available from the National Technical Information Service as PB-207 102, $3.00 in paper copy, $0.95 in microfiche. June 1971. 68 p, 44 fig, 6 tab. HUD Grant support.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage disposal, *Septic tanks, *Florida, Discharge (Water), Industrial wastes, Municipal wastes, Pollution abatement, Regulation, Regional analysis, Water pollution sources.
Identifiers: *Lake County (Florida), Agricultural wastes.

Total population and percent of total population served by municipal sewage treatment facilities, septic tanks, and private sewage treatment facilities were listed. An inventory of pollution sources such as drain wells, dumps and landfills, industrial wastes and sewage treatment facilities was presented. The daily discharge of the three major pollution sources were reported as: agriculture, 250 mgd, urban drainage, 50 mgd including 3.5 mgd of sewage, and industrial discharges, 23 mgd. The question of where and under what conditions septic tank development should be permitted in Lake County was discussed. Areas were suggested in which septic tank usage should be prohibited. Also, implementation techniques for septic tank regulation were suggested. (Galwardi-Texas)
W72-14383

POWER PLANT CYCLES FOR DRY COOLING TOWERS,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
P. Leung, and R. E. Moore.
Journal of the Power Division, Proceedings of ASCE, Vol 97, No PO4, Proc. Paper 8565, p 729-747, December 1971. 5 fig, 8 tab, 11 ref.

Descriptors: *Cooling towers, *Air, *Heat flow, *Powerplants, Power, Cycles, Towers, Turbines, Nuclear powerplants, Environmental gradient, Economics, Heated water, Heat exchange.
Identifiers: *Air cooling, *Steam-electric powerplants, Plant layout, Heat sink, Fossil-fueled power plants.

The use of dry cooling towers with air as the cooling medium will become more prevalent in the not-too-distant future as water quantities available for consumption in evaporative cooling processes for steam-electric generating plants become limited. Special considerations for designing either fossil-fueled or nuclear-fueled plants are required due to significant differences in turbine exhaust pressures which result in sizable capability losses. Those design considerations affecting turbine thermal cycles for steam-electric generating plants employing dry cooling towers are analyzed in this paper. Effects on major plant components, such as turbine exhaust end sizes, cycle parameters, and steam conditions, and the extent of feedwater heating within the regenerative cycle will be analyzed. Plant siting constraint considerations and general economic appraisals of fossil-fueled and nuclear-fueled cycles are summarized. (Oleszkiewicz-Vanderbilt)
W72-14395

THE CAPACITY OF COOLING PONDS TO DISSIPATE HEAT,
Ebasco Services Inc., New York.

W. D. Patterson, J. L. Leporati, and M. J. Scarpa.
Proceedings of the American Power Conference, Vol 33, p 446-456, 1971. 3 fig, 7 ref.

Descriptors: *Cooling, *Powerplants, *Thermal water, Model studies, Water treatment, Distribution, Heat transfer, Mathematical models, On-site data collections, Evaporation, Heat budget, Geographical regions, *Thermal pollution.
Identifiers: *Cooling ponds.

The use of once-through cooling systems for heated discharges from steam electric powerplants is declining due to increasing standards. Cooling ponds are one of several supplemental and closed-cycle systems being studied by utilities. The advantages of cooling ponds are given. A method of analyzing the heat dissipation from cooling ponds is then presented which uses the equations of Edinger and Geyer. These equations are first used to predict cooling pond temperatures at four existing steam electric powerplants. Good overall agreement between predicted and actual pond temperatures is shown at all stations. The same equations are used to plot the residual temperature rise for open and closed-cycle ponds against thermal loadings for fossil and nuclear plants at six different geographical locations. Total evaporative losses for closed-cycle ponds are then plotted against thermal loadings greater than 1 1/2 acres per megawatt for fossil and nuclear plants at the same six locations. The cooling pond requirements for a 2000-MW nuclear plant located in the Central United States are then computed to show the usefulness of the presented data. (Bass-Vanderbilt)
W72-14398

ECONOMICS AND OPERATING EXPERIENCE WITH AIR-COOLED CONDENSERS,
GEA-Gesellschaft fuer Luftkondensation m.b.H., Bochum (West Germany).
H. H. Von Cleve, W. J. Westre, and J. Y. Parce.
Proceedings of the American Power Conference, Volume 33, p 511-523, 1971. 7 fig, 4 ref.

Descriptors: *Thermal powerplants, *Heat, *Cooling, *Air, *Condensers, *Economics, Operating costs, Capital costs, Heat budget, Water pollution, *Thermal pollution, Evaporation, United States.
Identifiers: *Air-cooled condensers, *Operating experience, *Dry-cooled powerplants, Auxiliary equipment cost, Unit cost, Total energy cost, Wet-cooled powerplants.

The total energy cost for Neil Simpson Station No. 5 using an air-cooled unit is 79 percent of the total energy cost for Ben French Station No. 1 using a water cooled unit. This total energy comparison is for kWh delivered to the bus at each of these units. The only major difference in the performance of the equipment of the two units is the boiler and turbine which, due to design, are less efficient in both cases on the air-cooled unit. The one item which gives the air-cooled unit the advantage is the cost of fuel -- by being located at the fuel source, no transportation charges are incurred. An important cost factor which was not investigated in this comparison is the cost of developing and maintaining an adequate water supply for the water-cooled unit. Comparisons of different condensing systems should be carried out by optimizing the entire power station. Optimizations give exact results only when based on an estimated load-temperature schedule. The duration of extreme conditions should be considered. (Oleszkiewicz-Vanderbilt)
W72-14400

DRY-TYPE COOLING TOWERS,
Beck (R. W.) and Associates, Denver, Colo.
E. A. Cecil, P. R. Cunningham, C. J. Steiert, and R. O. Young.
Journal of the Power Division, Proceedings of ASCE, Vol. 98, No. P01, p 11-19, June 1972. 2 fig, 2 tab, 1 ref.

Descriptors: *Cooling towers, *Cooling water, *Electric powerplants, Electric power production, Utilities, Heat transfer, Heat exchangers, Power, *Thermal pollution, Heated water, Water utilization, Water supply, Water conservation.

Dry-type cooling towers offer a solution to power plant siting problems related to thermal pollution and water supply. Dry cooling towers are being used successfully with steam electric generating plants in other countries (particularly in Europe). At present, only two small dry cooled electric generating units are operating in the United States but plans for a 200 mw dry cooled generating unit in Wyoming have been announced recently. Direct and indirect dry-type towers are compared. The advantages of the dry cooling tower can be realized at a relatively low cost even if certain offsetting economies are not considered. All or part of the cost penalty related to dry cooling may be offset by fuel cost savings, water cost savings, transmission savings, or other savings resulting from the flexibility in plant siting permitted by the use of dry cooling systems. (Eagle-Vanderbilt)
W72-14404

OPTIONS FOR COOLING LARGE PLANTS IN THE 70'S,
T. C. Elliot.
Power, p 84-85, December 1970. 1 fig, 1 tab, 2 photos.

Descriptors: *Cooling towers, *Heat exchangers, *Thermal water, Cooling, Powerplants, *Thermal pollution, Water utilization.
Identifiers: Cooling lakes, Spray ponds.

The amount of waste heat from industry and power plants is expected to almost double by 1980. Present alternatives for cooling heated discharges are direct discharge of heated 'once-through' water into rivers and lakes, wet-mechanical-draft cooling towers, natural-draft hyperbolic cooling towers, a hybrid combination of natural-draft and mechanical-draft cooling towers, cooling lakes, spray ponds, and air-cooled heat exchangers. The advantages and disadvantages of each alternative are presented with respect to climate, cost, land requirements, efficiency and other factors. Water flow through various types of U.S. power plant condensers is listed for 1959, 1970 and 1980. (Bass-Vanderbilt)
W72-14410

WATER RESOURCES PLANNING STUDIES OKLAHOMA AND ARKANSAS, PHASE II (QUALITY),
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
For primary bibliographic entry see Field 05G.
W72-14432

REGIONAL WATER SUPPLY AND WASTE-WATER DISPOSAL PLAN AND PROGRAM, CAPITAL DISTRICT REGION.
Male (C. T.) and Associates, Schenectady, N. Y.
For primary bibliographic entry see Field 06B.
W72-14445

COMPREHENSIVE WATER AND SEWERAGE STUDY.
San Joaquin County Advisory Planning Association, Stockton, Calif.
For primary bibliographic entry see Field 06A.
W72-14447

METHOD FOR DISPOSING OF SLUDGE FROM SEWAGE AND INDUSTRIAL WASTES,
A. S. Goldberg.
U. S. Patent No. 3,561,598, 2 p, 7 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 603, February 9, 1971.

Descriptors: *Patents, *Sludge treatment, Sewage treatment, Industrial wastes, Pollution abatement, *Filtration, *Oxidation, *Waste water treatment.
Identifiers: *Oxidants.

Primary sludge is pumped into dilution tanks where it is reduced to a total solids content of 1 per cent to form a sludge slurry. It is then pumped into an open mixing or reacting tank through a mixing pipe. An oxidant is added - sodium hypochlorite is the preferred material. High speed mixing apparatus as well as piped recirculation equipment enable oxidation of the sludge to occur in less than 10 minutes. The slurry may be pumped to a feed box of a paper-making machine for filtration, drying and rolling. The resulting product has the appearance of paper fiber and may be used in the production of a variety of paper articles. (Sinha-OEIS)
W72-14452

AERATION APPARATUS,
Owens-Illinois, Inc., Toledo, Ohio. (Assignee).
For primary bibliographic entry see Field 05G.
W72-14454

SYSTEM FOR ELECTROCHEMICAL WATER TREATMENT,
Fischer and Porter Co., Warminster, Pa. (Assignee).
N. P. Gehring.
U. S. Patent No. 3,562,137, 10 p, 19 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 725, February 9, 1971.

Descriptors: *Patents, Water purification, Bubbles, Coagulation, *Oxygenation, Equipment, Flotation, Water pollution treatment, Pollution abatement, Separation techniques, Domestic wastes, Industrial wastes, *Waste water treatment, *Electrodialysis, *Membranes, Permeable membranes, Anions, *Chemical precipitation, Electrolysis, Electrochemistry.
Identifiers: *Electrochemical treatment.

Waste water containing dissolved and suspended organic and inorganic matter is fed into one ormore negative-ion isolation electrodialysis cells. Each cell includes an anion-permeable membrane surrounding an anode. The cells, arranged serially serve to increase the pH factor causing salts to precipitate, and organic matter is oxidized. Electrodialysis is accompanied by electrolysis, causing hydrogen and oxygen bubbles to form. Coagulation and flotation of suspended and precipitated matter takes place. The output of the positive-ion chamber is supplied to an air-flotation unit or other means to separate the coagulated and suspended solids from the ion treated water. (Sinha-OEIS)
W72-14455

FAIL-SAFE WATER PURIFYING APPARATUS,
Puretest Water Purifying Co. (Assignee).
For primary bibliographic entry see Field 05F.
W72-14456

SEWAGE TREATMENT PLANTS,
Compagnie d'Etudes et de Recherche des Services Operationnels d'Assainissement en France.
J. J. Regent.
U. S. Patent No. 3,563,382, 3 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 3, p. 1031, February 16, 1971.

Descriptors: *Patents, *Sewage treatment, Water treatment, *Waste water treatment, *Treatment facilities, Equipment, Pollution abatement, Water pollution treatment, Water pollution control, *Control systems.

The sewage treatment plant consists of a primary feeding tank for receiving liquid raw sewage. It has at least one digester with a biologically active filter

bed. A program timer is correlated with the float device and actuates a recirculation valve. The timer is also correlated with the device which controls the operation of the pump. The flow of recirculated effluent is inversely proportional to the flow of raw sewage, which corresponds to the desired operative conditions of the plant. There are a set of sludge areas. (Sinha-OEIS)
W72-14459

PURIFICATION SYSTEM FOR ORGANICALLY CONTAIMINATED WATER,
A. Hellquist, and S. Nordgard.
U. S. Patent No. 3,563,383, 4 p, 9 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 3, p. 1031, February 16, 1971.

Descriptors: *Patents, Waste water, *Biological treatment, *Waste water treatment, Equipment, Treatment, Pollution abatement, *Water purification, Water quality, Biological treatment, *Microorganisms, *Organic wastes, Water pollution control, Water pollution treatment.

Waste water moves in continuous contact with a large active area which is designed as one or more screw threads on a rotating roller or in the form of laminate discs lying along helixes on a belt running over rollers. The active areas carry a continuous layer of microbes which consume the biological impurities in the waste water. The active area is located above the water surface during a definite portion of the circulation cycle enabling the microorganisms to obtain the necessary oxygen and to recover from the effects of any toxins present in the waste water. (Sinha-OEIS)
W72-14460

SAND FILTER FOR WATER PURIFICATION,
S. I. Bykov.
U. S. Patent No. 3,563,385, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 883, No 3, p 1032, February 16, 1971.

Descriptors: *Patents, *Water purification, *Waste water treatment, Water treatment, *Filters, *Filtration, Equipment, Sands, Separation techniques, Pollution abatement, Water pollution, Water pollution treatment, Water quality.
Identifiers: *Sand filters.

External channels feed the water to be purified to the outer of two spaced, vertical walls which are water permeable. A water collecting chamber is provided within the inner wall and it communicates with a water collecting manifold arranged in the lower part of the filter. Contaminated water is admitted into the manifold through a pipe. It flows through vertical ducts and openings into space under the perforated grates and into the space filled with sand. After being cleaned of contaminating matter, the water flows through the slots in the walls and enters the collecting chamber. (Sinha-OEIS)
W72-14451

METHOD AND APPARATUS FOR TREATING WASTE-CONTAINING LIQUOR,
Research Corp., (Assignee) New York.
J. W. Klock.
U. S. Patent No. 3,563,888, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 883, No 3, p 1146, February 16, 1971.

Descriptors: *Patents, *Filtration, *Liquid wastes, *Aeration, Biological treatment, Pollution abatement, Water pollution treatment, Equipment, Separation techniques, Waste water treatment.
Identifiers: *Sand-gravel filters.

The liquid is treated by continuously recirculating it through a sand-gravel filter media. A pressurized column of oxygen-containing fluid entrains and lifts the liquid waste through an unobstructed tube and recirculates it downward through the filter. (Sinha-OEIS)
W72-14462

METHOD FOR INCREASING OXYGEN AVAILABILITY IN SEWAGE TREATMENT,
Biospherics Inc., Rockville Md. (assignee).
G. V. Levin.
U. S. Patent No. 3,565,796, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1617, February 23, 1971.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Chlorination, *Oxygenation, Equipment, Treatment, *Aerobic treatment, Microorganisms, Biodegradation, Pollution abatement, Water pollution treatment, *Sewage treatment.

Sewage is introduced into an aeration zone where it is in continuous contact with oxygen containing bubbles. The sewage is admixed with a high capacity oxygen solvent in the aeration zone. The solvent may be selected from the group consisting of glycerol, butanol and ethylene glycol. After leaving the settling zone the clarified liquid undergoes chlorination before passing into the disposal area. (Sinha-OEIS)
W72-14468

APPARATUS AND PROCESS FOR TREATING SEWAGE,
P. J. Gresham.
U. S. Patent No. 3,565,797, 7 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1617, February 23, 1971.

Descriptors: *Patents, *Waste water treatment, *Filtration, *Sewage treatment, Algae, *Aeration, Sedimentation, *Chlorination, Oxidation, Pollution abatement, Water pollution treatment, Water quality, Streams, Lakes, Biochemical oxygen demand, *Oxygenation, *Anaerobic bacteria, Biological treatment.

Sewage is fed into contact with a bed of living filamentous macroscopic algae. The sewage is oxygenated and the growth of anaerobic bacteria is inhibited. The sewage is filtered through the algae bed or screen. Solids are collected on the screens as sludge for separate disposal and the sewage liquid undergoes chlorination before disposal. The sludge is recycled for removal of remaining liquids. (Sinha-OEIS)
W72-14469

WASTE TREATMENT SYSTEM,
D. P. Morisseau, Jr.
U. S. Patent No. 3,567,021, 4 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 158, March 2, 1971.

Descriptors: *Patents, *Waste water treatment, *Liquid wastes, Sewage treatment, Equipment, *Aeration, Pollution abatement, Separation techniques, *Biological treatment, Water pollution treatment.

This system for biologically treating waste water consists of an inner tank having an aeration and mixing chamber. The chamber has a lower influent receiving zone and an upper mixing zone exposed to the atmosphere. In the mixing zone, aeration and recirculation is effected by use of a double impellor, vertical baffles prevent vortex action within the aeration zone. The inner tank is spherical, the outer tank is cylindrical and the lower and upper settling chambers formed between the outer and inner tanks have an intermediate zone of restricted area to provide quiescent zones immediately adjacent to the bottom and top levels of the effluent within. (Sinha-OEIS)
W72-14471

PROCESS AND PLANT FOR TREATING SEWAGE,
Mead Corp., Chillicothe, Ohio. (assignee).
K. C. Ayers, and D. W. McAnaney.
U. S. Patent No. 3,567,629, 3 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 293, March 2, 1971.

Descriptors: *Patents, *Liquid wastes, *Organic wastes, Biodegradation, *Sewage treatment, *Waste water treatment, *Aerobic treatment, *Lagoons, Sumps, Pollution abatement, Water pollution treatment, Treatment facilities, Equipment, Trickling filters.

An aerobic lagoon receives raw waste mixed with effluent from a trickling filter. Waste from the bottom of the lagoon is constantly recirculated through the trickling filter. Purification and increased efficiency of removal of setteable solids from clarified overflow effluent result from the removal of such effluent from quiescent zones within the lagoon. (Sinha-OEIS)
W72-14473

THE ECONOMICS AND USE OF LARGE SCALE ELECTRODIALYSIS PLANTS ON SELECTED TIDAL ESTUARIAL WATERS,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 03A.
W72-14648

NITROGEN REMOVAL FROM WASTEWATERS.
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste 'Treatment Research Lab.

Available from the National Technical Information Service as PB-212 280, $3.00 in paper copy, $0.95 in microfiche. Federal Water Quality Administration Report, October 1970. 32 p, 36 ref. FWQA Project 17010---10/70.

Descriptors: *Nitrogen, *Separation techniques, *Waste water treatment, Ammonia, Nitrates, Nitrites, Amino acids, Biodegradation, Nitrification, Denitrification, Ion exchange, Chlorination, Oxidation, Cost analysis, Technical feasibility, Economic feasibility.
Identifiers: *Ammonia stripping.

Ammonia and nitrates are the principal forms of nitrogen in wastewaters. Ammonia is converted to nitrates by biological oxidation. Because of this reaction it exerts a high BOD in surface waters. Nitrates are reduced to nitrogen gas by bacteria when organic matter exceeds the oxygen supply. Both compounds are algal nutrients but ammonia is much more toxic than nitrates. The best developed method for control of nitrogen compounds is biological oxidation to nitrates followed by denitrification with the aid of methanol. Ammonia stripping at high pH in cooling towers following lime treatment is effective but cannot be used during freezing weather and may suffer from serious scale problems. Selective ion exchange of ammonia with lime regeneration may be practical but the process is still in the pilot stage. Several other processes are being studied. A bibliography of pertinent references is attached. (See also W72-04085)
W72-14650

BACTERIOLOGICAL CONTROL OF PURIFICATION SYSTEMS AND RECEIVING WATERS WITH THE USE OF A MEMBRANE FILTER AND A DIAPHRAGM FILTER, (BAKTERIOLOGISCHE KONTROLLE VON KLARANLAGEN UND VORFLUTERN MITTELS MEMBRANFILTER UND NAHRKARTONSCHEIBEN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
B. Wachs.

In: Methodik der Untersuchung von Abwasser und Vorfluter, Munchen und Wien, p 69-94, 1971. 3 fig, 13 tab, 27 ref.

Descriptors: *Water purification, *Biocontrol, *Bacteria, *Filters, *Filtration, *Membranes, *Biological membranes, *Waste water treatment, Water pollution treatment, Enteric bacteria, Coliforms, Pollutant identification, Bioindicators.
Identifiers: Receiving waters, Diaphragm filters.

Bacteriological control of sewage treatment plants and receiving waters was accomplished with the help of a diaphragm filter. Concentrations of coliform bacteria and enterrococci were investigated in different purified waters. Biological treatment eliminated 90-99% of the bacteria. Coliform bacteria are good pollution indicators for estuaries, coastal areas and even at sea as they indicate the influence of domestic waste when chemical methods fail. (Ensign-PAI)
W72-14666

EFFECT OF TOXIC WASTES ON TREATMENT PROCESSES AND WATERCOURSES,
Water Pollution Research Lab., Stevenage (England).
S. Jackson, and V. M. Brown.
Paper presented at The Institute of Water Pollution Control, Annual Conference, Douglas, Isle of Man, September 16-19, 1969, Conference Paper No 2C. (1969) 14 p, 7 fig, 8 tab, 63 ref.

Descriptors: Water pollution effects, *Biological treatment, *Waste water treatment, *Organic compounds, *Heavy metals, Sewage bacteria, Aerobic bacteria, Anaerobic bacteria, Methane bacteria, Sewage treatment, Sewage effluents, Waste water (Pollution), Water pollution, Water quality, Biodegradation, Environmental sanitation, Industrial wastes, Microbial degradation, Toxicity, Chlorinated hydrocarbon pesticides, Mercury, Copper, Nickel, Zinc, Iron, Lead, Cadmium, Phenols, Dichromate, Manganese, Arsenic compounds, Aquatic life, Aquatic environment, Fish physiology, Detergents.
Identifiers: *Toxic wastes, Silver, Vanadium, Cyanide, Anionic detergents.

Anaerobic digestion of sewage sludge is more sensitive than aerobic sewage treatment to inhibition by toxic substances, notably chlorinated organic compounds and heavy metals. Nitrification is the most sensitive aspect of the aerobic processes, although considerable acclimatization to inhibitors is possible. In general, biological treatment processes are able to protect watercourses from a variety of toxic organic compounds, after acclimatization at least, by degrading them; others are removed, to different extents, by volatilization, adsorption or precipitation. Quite large proportions of some organic substances, and of some heavy metals, are not removed, and pass on to the receiving watercourse. A limited amount of information is available about the effects of toxic substances on other forms of river life, but their impact on watercourses is usually assessed in terms of their toxicity to fish. Data are available on the toxicity of many substances to fish, but they are usually limited to determinations of the LC50 in 48-96 hr, at high concentrations of poison. There is still great uncertainty about the long term toxic effects of much lower concentrations under natural conditions; recent laboratory results defining the dose-response curves for a number of metals and organic compounds tend to reinforce the caution, that, in some cases, one-third of the 48 hr LC50's may be too high for safety. (Svensson-Washington)
W72-14691

A SURVEY OF ALTERNATE METHODS FOR COOLING CONDENSER DISCHARGE WATER--SYSTEM SELECTION, DESIGN, AND OPTIMIZATION.
Dynatech R/D Co., Cambridge, Mass.
Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-212 392, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1971, 108 p, 11 fig, 13 tab, 13 ref. EPA Program 16130 DHS 01/71.

Descriptors: *Power plants, *Computer programs, *Heat exchangers, *Water cooling, Water costs, Cost analysis, Design, *Electric power costs, Optimization, *Thermal pollution, Waste water treatment.

A computer program was written to calculate cooling system and power plant cost and to determine the minimum total cost for a given set of parameters. Design equations based on the use of water cooled condensers, cooling towers, open cooling systems, operation of the power plant and the cooling system at various ambient conditions or even operation of the power plant at up to five off-design capacities have been provided for in the computer program, through which the minimum total cost is calculated. (See also W72-06616, W72-06617, and W72-04830) (Smith-Texas)
W72-14724

CONNECTICUT RIVER BASIN PLAN FOR COMPREHENSIVE DEVELOPMENT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 08A.
W72-14751

RESEARCH TO DEVELOP AND DEMONSTRATE A MOBILE PILOT PLANT FOR REMOVAL OF PHOSPHATE FROM WASTEWATERS BY ADSORPTION ON ALUMINA,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
L. L. Ames, Jr.
Available from the National Technical Information Service as PB-212 374, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series, June 1971. 31 p., 15 fig, 2 tab, 2 ref. FWQA Program 17010 EER 06/70. Contract 14-12-566.

Descriptors: *Adsorption, *Phosphorus, *Pilot plants, Calcium hydroxide, Filters, Sodium compounds, *Waste water treatment, *Filtration, Operating costs, *Chemical precipitation, Water reuse, Recycling.
Identifiers: *Alumina, Adsorbents, Mobile pilot plants.

Alumina, a phosphorus-selective adsorbent, was used in a tertiary chemical process for phosphorus removal. A mobile pilot plant designed and built on the basis of laboratory results was fitted into a standard forty-foot van trailer. The secondary effluent was passed through a thirty inch multimedia filter bed and stored in an exterior 1500 gallon surge tank. Then the filtered sewage was pumped through one or more of three alumina beds approximately forty inches in depth and three feet in diameter. Phosphorus loading of the alumina columns can be in a downflow or upflow direction with the columns in series or parallel. Phosphorus-free effluent was stored in another tank for use as alumina column wash solution. 800 gallons of 1M NaOH was recirculated to remove absorbed phosphorus in an alumina column taken off the line. Valving and column washing was pH controlled. Ca (OH)2 was added to the NaOH solution in a mixing tank to precipitate phosphorus in the form of hydroxyapatite. The solids were removed in a continuous centrifuge and the Na (OH) returned for reuse. Initial operating costs were approximately 5.8 cents/1000 gallons. (Smith-Texas)
W72-14789

SORPTION CAPACITY ESTIMATION FOR ACTIVATED CARBON PACKED COLUMNS,
Wisconsin Univ., Madison. Water Chemistry Lab.
J. O. Peterson, and G. Lee.
Water Research, Vol. 5, p. 717-721, 1971. 4 fig., 3 ref. FWPCA Grant WP-00371.

Descriptors: Analytical techniques, *Activated carbon, *Rhodamine, *Sorption, Estimating, Columns, Dyes, Model studies, Tracers, Fluorometry, Testing procedures, Wastewater treatment.

Results of laboratory data on sorption of a fluorescent dye onto activated carbon indicate that bench scale studies could provide realistic estimates of sorption rates and capacity in large scale columns. Using Rhodamine B Extra, a pink fluorescent dye in aqueous solution as the sorbate and activated carbon as the sorbent and a fluorometer for both discrete and continuous determination of Rhodamine B concentration, batch sorption experiments were conducted. The dye concentration in the supernate was determined periodically and dye uptake by the carbon computed by difference. Amount of dye which was sorbed as a function of time was determined by reading the counter on the feed burette. Rate and capacity data were thus collected with constant dye concentrations of 100, 250, and 1000 micrograms/l at 25C. A correlation between unfilled sorption capacity and sorption rate and ultimate sorption capacity and dye concentration were developed which should be used to estimate dye concentrations in a larger scale packed column at any point using a model that assumes that a column is composed of finite increments of packing which are subjected to an essentially constant dye concentration under plug flow conditions. (Jones-Wisconsin)
W72-14795

ADSORPTION CHARACTERISTICS OF COALS AND CHARS,
Pennsylvania State Univ., University Park. Dept. of Material Sciences.
S. P. Nandi, and P. L. Walker, Jr.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $0.70. Department of the Interior, Office of Coal Research, Research and Development Report No. 61, Interim Report No. 1, 1972. 59 p, 30 fig, 9 tab, 9 ref.

Descriptors: *Coals, *Activated carbon, *Bituminous coal, *Adsorption, *Waste water treatment, Secondary treatment, Pores, Dyes, Economics, Water treatment.
Identifiers: *Chars, Gasification, Amaranth red dye, Metanil yellow dye, Methylene blue dye.

Coals and chars were compared with activated carbon for use in water treatment. The static adsorption of nitrogen at low temperatures and the adsorption of three dye molecules from solution in water at 25C was used to study the internal surface area of the coals, chars, and active carbons available for adsorption. Forty coals varyifig in rank from anthracite to lignite were studied. High volatile-C (HVC) bituminous coals showed the greatest adsorption capacity. Readily available granular activated carbons had 15 times the capacity of the best coal. Chars were formed by the gasification of coal and had 25% of the adsorption capacity of commercial activated carbons. Although commercial activated carbons have more adsorption capacity and a faster adsorption rate for liquid organic molecules than coals and chars, their cost is considerably more than coals and chars. The greater weight of material to be handled and the variability in adsorption capacity from batch to batch may offset this cost. (Smith-Texas)
W72-14814

A REVIEW OF ON-SITE DOMESTIC SEWAGE TREATMENT PROCESSES AND SYSTEM ALTERNATIVES,
MITRE Corp., McLean, Va.
S. N. Goldstein, and V. D. Wenk.

Available from the National Technical Information Service as PB-209 956, $3.00 in paper copy, $0.95 in microfiche. January 1972. 18 p, 5 fig.

Descriptors: *Domestic wastes, *Aerobic treatment, *Septic tanks, *Cesspools, Leaching, Soil contamination, *Sewage treatment, *Waste water treatment, Anaerobic digestion.
Identifiers: *Incinerator toilets.

Basics of sewage treatment, microorganisms in sewage and aerobic and anaerobic treatment in individual home wastewater systems were reviewed. Systems such as incinerator toilets and aerobic tanks are considered alternatives for home wastewater treatment. Effective utilization of individual systems will depend on the formation of collective bodies for the design, installation, inspection and maintenance of the systems. (Smith-Texas)
W72-14815

ION-EXCHANGE SYSTEM BOASTS MORE PULLING POWER,
Rohm and Haas Co., Philadelphia, Pa.
R. Kunin, and D. G. Downing.
Chemical Engineering, Vol 78, No 14, June 28, 1971, p 67-69. 1 fig, 2 tab.

Descriptors: *Ion exchange, *Acid mine water, *Tertiary treatment, *Sewage effluents, Anion exchange, Resins, Dissolved solids, Brackish water, Total costs, Estimated costs, Performance, *Waste water treatment.
Identifiers: Amberlite IRA-68, Amberlite IRA-93, Desal system.

A new deionization technique, called the Desal process, that is based on two weak electrolyte ion-exchange resins that can be used with waters containing up to 3,000 ppm total dissolved solids was developed by Rohm and Haas Co. Besides the treatment of brackish and acid mine water, Desal has been suggested for tertiary treatment of treated water. In the treatment of an acid mine water, the metals concentration of feedwater was reduced tenfold, from 3,000 to 300 ppm. Results of treatment of acid mine water and chlorinated secondary effluent were presented in tabular form. Either of two weak base anion exchange resins, Amberlite IRA-68 or IRA-93 provide the key to the Desal system. The anion-exchange resin functions in the bicarbonate cycle to treat the acid mine water. The effluent water is aerated and subsequently clarified. The quality is further improved through a mild softening treatment followed by a final filter. The total cost to process a typical acid mine water was estimated at 30 cents/1,000 gal. For tertiary treatment the flow process differs in that before aeration of the water, flocculant treatment is used in conjunction with old brine softening to further reduce the organic content of the water and eliminate a substantial amount of hardness. For the additional removal of NH4 a cation exchange may be used after the coagulation. (Galwardi-Texas)
W72-14816

BIOLOGICAL TREATMENT OF INDUSTRIAL WASTE WATERS,
Water Pollution Research Lab., Stevenage (England).
A. B. Wheatland, and A. M. Bruce.
Paper presented at 3rd Public Health Engineering Conference, Loughborough University of Technology, January 1970. 22 p, 11 fig, 4 tab, 25 ref. Water Pollution Research Laboratory Reprint No. 598.

Descriptors: *Waste water treatment, *Activated sludge, *Trickling filters, *Industrial wastes, Water quality, *Biological treatment, *Oxidation lagoons.
Identifiers: *Contact stabilization, Extended aeration, Anaerobic filters, *Grass plot irrigation.

Industrial wastewaters are commonly treated by biological methods. Depending on the type of waste and the strength of the wastewater, the industrialist has several options available to him: he can discharge the waste water directly to the public sewer; he can treat the waste to a strength acceptable to the public authorities and then discharge to the public sewers; or, he can provide full treatment to the specifications of the river authority and discharge to the river. There are a variety of aerobic treatment methods commonly used. These are activated sludge, biological filters, oxidation ponds, and grass plot irrigation. Variations of some of these methods are contact stabilization and extended aeration. Anaerobic treatments are anaerobic filters and ponds. Factors influencing these processes are discussed. The degree of treatment and the quality of the effluent are presented. (Goessling-Texas)
W72-14818

BOD DETERMINATIONS ON FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. J. McGhee, R. L. Torrens, and R. J. Smaus.
Water and Sewage Works, Vol 119, No 6, June 1972, p 58-61. 7 fig, 1 tab, 20 ref. OWRR A-022-NEB (2).

Descriptors: *Analytical techniques, *Biochemical oxygen demand, *Pollutant identification, *Cattle, Organic matter, Chemical oxygen demand, Oxygen demand, *Feed lots, *Farm wastes.
Identifiers: *Cattle feedlot runoff, Ultimate BOD.

During laboratory studies of the aerobic treatment of feedlot runoff it was observed that significant reductions in the COD of the waste were not reflected in a similar reduction in BOD as determined by the standard 5-day tests. The rate at which the oxygen demand was exerted, the duration of the BOD test necessary to actually measure the pollution effect of such wastes and the general applicability of the standard BOD test to feedlot wastes were investigated. It was concluded that the standard 5-day BOD determination was not an adequate measure of the pollution potential of feedlot runoff as feedlot runoff contained slowly degradable organic materials which would exert a significant oxygen demand over periods in excess of 20 days. The chemical oxygen demand test was a superior technique although it usually yielded higher results than the actual ultimate BOD. (Galwardi-Texas)
W72-14819

FACTORS AFFECTING OXYGEN TRANSFER IN THE ELECTROLYSIS BOD SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
D. A. Haselhoff.
Master's Thesis, 1971. 145 p, 50 fig, 16 tab, 64 ref.

Descriptors: *Waste identification, *Biochemical oxygen demand, *Analytical techniques, *Electrolysis, Oxygen requirements, Nutrients, *Waste water treatment, Water analysis.
Identifiers: *Oxygen transfer, Oxygen uptake rates, Substrate concentration stirring, Buffers, Seed concentration.

An investigation was conducted to define quantitatively the extent to which various parameters affect oxygen transfer and the electrolysis BOD test. The sole controlling factor in the determination of BOD with the electrolysis system was the maintenance of a sufficient oxygen transfer rate to meet the demands of the sample. Buffer concentration, seed concentration, substrate concentration, and nutrient concentration did not affect the reaction unless the dissolved oxygen concentration became so low that oxygen acted as a limiting nutrient. Stirring of the sample such that a 2-3 inch vortex occurred in the sample bottle insured that the reaction was independent of the stirring rate as long as the oxygen uptake rate did not exceed about 12 mg/l/hr. Samples with uptake rates greater than 12 mg/l/hr should be diluted. Buffer concentration above 0.005 M had no effect on the BOD or the shape of the BOD curve. Substrate utilization rate controlled the reaction when substrate concentration was greater than about 1,200 mg/l BOD. (Galwardi-Texas)
W72-14820

STATE OF THE ART OF TEXTILE WASTE TREATMENT.
Clemson Univ., S. C. Dept. of Textiles.

Copy available from GPO Sup Doc EP2.10:12090 ECS, $2.50; microfiche from NTIS as PB-212 359, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, February 1971, 348 p, 23 fig, 41 tab, 58 ref. EPA Program 12090 ECS 02/71.

Descriptors: *Textiles, *Dye, *Industrial wastes, *Cost comparisons, Fibers, *Waste water treatment, Waste treatment, *Reviews, *Pulp wastes, Treatment facilities, Water reuse, Sludge disposal, Pollution abatement, Reverse osmosis, Electrolysis.
Identifiers: *Desizing.

Waste treatment methods and practices used in the textile industry have been studied. The literature was reviewed and an annotated bibliography prepared to supplement the information obtained from people working in the textile processing industry, designing waste treatment plants, and enforcing state and federal regulations on waters discharged to streams and natural reservoirs. Information was given on: characteristics of textile waste, waste treatment techniques, treatment methods in use, effects of textile wastes on receiving waters, the cost of waste treatment operations, and state and federal regulations governing discharge waters. More research is needed on desizing, removal of dyes from textile wastes, electrolytic treatment of textile waste, space requirements of waste treatment plants, reverse osmosis, sludge handling and disposal, water reuse in textile plants, total carbon analysis, mixing of textile and domestic waste, and pilot plants. A cooperative pollution abatement organization for the textile industry should be formed. (Smith-Texas)
W72-14827

AIR OXIDATION OF ORGANIC COMPOUNDS IN AQUEOUS SYSTEMS,
Connecticut Univ., Storrs. Inst. of Water Resources.
D. W. Sundstrom.
Available from the National Technical Information Service as PB-212 360, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1972. 5 p, 1 fig. OWWR A-019-CONN (2).

Descriptors: *Oxidation, *Liquid wastes, *Waste disposal, *Waste treatment, Organic compounds, Mass transfer, Dissolved oxygen, Temperature, Carbon, Plastics, Pressure.
Identifiers: *Wet oxidation, *Air oxidation, *Rotating disc geometry, *Nylon 66, Surface reaction kinetics, Nitric acid.

Wet oxidation is a newer technique for disposal of aqueous wastes by air oxidation under pressure. The rates of oxidation of several solid organic compounds were studied over a range of conditions. Experiments were conducted in a versatile reactor system, which would be operated as a batch, semi-batch or flow reactor. The solid reactants, in the form of cylindrical discs, were attached to the shaft of a variable speed drive. With a rotating disc geometry, the kinetics of the surface reaction can be separated from mass transfer effects. Solid carbon and graphite were largely un-

reactive at temperatures up to 600 degrees F; a measurable reaction rate was obtained only in solutions containing nitric acid. The wet oxidation of several solid plastics was also explored with the rotating disc reactor. In particular, nylon 66 was oxidized over a range of temperatures, pressures, and disc rotational speeds. A rate expression was developed relating the nylon degradation to dissolved oxygen concentration and reaction temperature.
W72-14836

WATER QUALITY CONTROL WITH SYNTHETIC POLYMERIC FLOCCULANTS: EFFECT OF METAL IONS ON FLOCCULATION OF BIOCOLLOIDS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05G.
W72-14840

WASTES GENERATED IN THE MANUFACTURE OF SAUERKRAUT,
New York State Agricultural Experiment Station, Geneva.
Y. D. Hang, D. L. Downing, J. R. Stamer, and D. F. Splittstoesser.
Journal of Milk Food Technology, Vol 35, No 7, p 432-435, July 1972. 4 tab, 12 ref.

Descriptors: *Brines, *Waste treatment, Solid wastes, *Waste water treatment, Industrial wastes, Liquid wastes, Effluents.
Identifiers: *Sauerkraut, *Cabbage processing, Sauerkraut manufacturing.

Two sauerkraut factories were surveyed to obtain quantitative data on the wastes generated. Solid wastes due to trimming were over 35 tons per 100 tons of raw cabbage processed and the 'early brine' and 'late brine' total represented about 29% of the salted, shredded cabbage. Other waste effluents included vat soak water, vat wash water, and can cooling water. Approximately 345 gal. of waste effluents were discharged per ton of cabbage processed; the BOD ranged from about 11 to 13 lb. per ton. The brine has enough nutrients for optimal biological stabilization. (Smith-Texas)
W72-14847

COMPUTER SIMULATION OF ACTIVATED SLUDGE PLANT OPERATION,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
P. G. Lacroix, and D. E. Bloodgood.
Journal Water Pollution Control Federation, Vol 44, No 9, p 1778-1788, September 1972. 1 fig, 7 tab, 14 ref.

Descriptors: *Activated sludge, Mathematical models, *Municipal wastes, *Waste water treatment, Model studies, *Computer models, *Simulation analysis.
Identifiers: *Sensitivity analysis, Waste treatment plant operation.

A computer model was formulated to represent the operations of an activated sludge wastewater treatment plant using data accumulated from existing plants. The analysis and computer simulation of the system was facilitated by partitioning the activated sludge system into two parts: (1) aeration and (2) sedimentation tanks. Although mathematical simulation can be used to describe the effect of different factors, such as flow, BOD, suspended solids, temperature, sludge age, and rate of recirculation, on several significant parameters (mixed liquor suspended solids, return sludge suspended solids, amount of sludge produced) involved in the functioning of an activated sludge plant, no single mathematical simulation exists for all activated sludge plants. The simulation method allows for a more economical means of investigation without actual field trials. (Smith-Texas)
W72-14850

PRELIMINARY INVESTIGATIONAL REQUIREMENTS-PETROCHEMICAL AND REFINERY WASTE TREATMENT FACILITIES.
Engineering-Science, Inc./Texas, Austin.

Copy available from GPO Sup Doc EP2.10:12020 EID 03/71 $1.50; microfiche from NTIS as PB-212 369, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1971. 173 p, 38 fig, 28 tab, 112 ref. EPA Program 12020 EID 03/71.

Descriptors: *Waste water treatment, *Water pollution control, *Pollution abatement, *Pollutant identification, *Industrial wastes, Water quality control, Sludge, Sewage treatment, Biochemical oxygen demand, Heavy metals, Organic loading, *Treatment facilities, Design.
Identifiers: *Treatability study, *Waste water characterization.

Case studies indicate that locating, analyzing, and properly interpreting the nature of pollutional sources within a petrochemical or refinery complex is the basis from which a treatability study can be developed. Each of the waste waters including normal process and utility effluent, contaminated storm runoff, ballast water discharge, and other related sources of waste water, must be properly characterized with respect to their organic and inorganic constituents. The treatability study must be programmed to yield definitive information concerning pollutional removal rates, anticipated levels of residual or non-removable constituents, and treatment process requirements. The overall project of evaluating the treatability of a waste water is predicated on the assimilation of sufficient information from which the optimal selection of treatment processes can be made. (See also W72-03299) (Smith-Texas)
W72-14852

TREATMENT OF INDUSTRIAL WASTES AT REGIONAL FACILITIES,
Rollins-Purle, Inc., Wilmington, Del.
H. A. Alsentzer.
Chemical Engineering Progress, Vol 68, No 8, August 1972, p 73-75.

Descriptors: *Waste water treatment, *Industrial wastes, *Incineration, *Pollution abatement, *Treatment facilities, Delaware, Waste treatment.
Identifiers: *Treatment costs.

With improved enforcement of pollution laws, regional waste treatment plants will provide the means of dealing with 'hard' pollutants. Rollins-Purle, Inc., has built three regional waste treatment plants that handle materials with maximum pollution potential such as chlorinated hydrocarbons, etchants, pesticides, plating, and pickling baths, high BOD and COD aqueous organic solutions, and tank bottoms from petroleum refineries. Current prices charged for treatment vary from as low as $0.075/gal. for a single pass biological treatment to as high as $0.70/gal. for the handling, incineration, and scrubbing of dangerous complex organic materials. (Smith-Texas)
W72-14854

INVESTIGATIONS ON THE PURIFICATION OF INDUSTRIAL WASTES FROM DETERGENTS BY HYPERFILTRATION,
Technical Univ. of Szczecin (Poland). Inst. of Chemical Engineering.
J. Kepinski, and N. Chulubek.
International Chemical Engineering, Vol 12, No 3, July 1972, p 499-501. 1 fig, 10 ref.

Descriptors: *Detergents, *Industrial wastes, *Separation techniques, *Reverse osmosis, *Waste water treatment, Filtration, Mathematical studies, Laboratory tests.

Hyperfiltration (reverse osmosis) was used to separate detergents from water solutions and dye-containing solutions. The system was designed mathematically and resulted in the removal of 98% detergent from water solution and 85% from the dye-containing solutions. (Smith-Texas)
W72-14856

THE 'UNOX' SYSTEM-OXYGEN AERATION IN THE ACTIVATED SLUDGE PROCESS,
Union Carbide Corp., Tonawanda, N.Y. Linde Div.
E. A. Wilcox, and J. R. McWhirter.
Journal of the American Oil Chemists Society, Vol 48, No 10, October 1971. 7 p, 4 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Oxygen, *Activated sludge, *Aeration, Biochemical oxygen demand, Efficiencies, Performance, Municipal wastes, Industrial wastes, Pilot plants, Pulp and paper industry, Suspended solids, *New York.
Identifiers: Oxygen aeration, Petrochemical wastes, *Batavia (N.Y.).

The use of enriched oxygen in a simple and economical multistage gas liquid contacting device allowed the oxygen to be transferred to waste water at increased rates with significant decreases in power requirements over those required when using air as the oxygen supply media. The elimination of the mass transfer restriction allowed operation at solids levels of 4500-7000 mg/l while maintaining a dissolved oxygen level of 8-10 mg/l in the mixed liquor. Retention times for the process can be correspondingly decreased to 1-2 hours. A highly flocculant sludge was obtained which has excellent settling and dewatering characteristics and was produced in less quantities than normally produced by a conventional air activated sludge process. The process was demonstrated in a 2.5 MGD activated sludge plant at Batavia, New York in which consistent BOD and suspended solids removals in excess of 90% were obtained. Pilot plant programs in municipal waste applications along with applications in mixed petrochemical wastes and pulp and paper wastes were planned. (Galwardi-Texas)
W72-14858

CHARACTERISTICS OF YEASTS ISOLATED FROM PHENOL- AND CATECHOL-ADAPTED ACTIVATED SLUDGE,
Indian Inst. of Science, Bangalore. Microbiology and Pharmacology Lab.
B. Rao Venkata, and J. V. Bhat.
Antonie Van Leeuwenhoek; Journal of Microbiology and Serology, Vol 37, p 303-312, 1971. 3 fig, 4 tab, 31 ref.

Descriptors: *Activated sludge, *Phenols, *Yeasts, *Waste water treatment, Fungi.
Identifiers: *Candida tropicalis, *Trichosporon cutaneum.

Activated sludge was slowly adapted to phenolic compounds, namely phenol and catechol, and resulted in the enrichment of two species of yeasts. Both of the yeasts, Candida tropicalis and Trichosporon cutaneum, were able to grow on a variety of aromatic compounds and utilized phenol and catechol at a high rate. It is suggested that activated sludge of this type should be used to remove phenols from waste water. (Smith-Texas)
W72-14860

WASTE WATER RENOVATION IN CONNECTICUT SOILS,
Connecticut Agricultural Experimental Station, New Haven.
D. E. Hill.
Journal of Environmental Quality, Vol 1, No 2, April-June, 1972, p 163-167, 3 fig, 3 tab, 20 ref.

Descriptors: *Soil tests, *Soil horizons, *Soil investigations, *Leachate, Soil types, *Waste water

treatment, Water quality, Sewage effluents, Phosphates, Nitrates, Acidic soils, *Connecticut.

Six diverse Connecticut soils were used to determine waste water renovation potential by ion removal. For two years 2.54 cm (1 in) of a synthetic sewage effluent containing cations of Na+, Ca2+, K+, and Mg2+ and anions of Cl-, NO3-, SO2-4 and PO3-4 was applied semiweekly to undisturbed cores, 30 cm diameter and 100 cm deep. Virtually all PO4 was removed from the effluent by the A horizon of the acid soils. All soils except the sandy Merrimac soil and the calcereous Stockbridge soil removed greater than 85% K, 75% Ca and Mg, but less than 10% Na. Although all SO4 passed through the acid soils after 1 year, there was partial removal of sulphate during the first year. There was no removal of nitrate or chloride from the start. After 2 years of testing, the results indicate that the longevity of the soil systems studied will vary between 10 and 13 years. Since permeability and ion removal capacity vary, each soil must be examined to determine safe loading rates. (Smith-Texas)
W72-14863

A STUDY OF SELECTED ECONOMIC AND ENVIRONMENTAL ASPECTS OF INDIVIDUAL HOME WASTE WATER TREATMENT SYSTEMS,
MITRE Corp., McLean, Va.
S. N. Goldstein, V. D. Wenk, M. C. Fowler, and S. S. Poh.
Available from the National Technical Information Service as PB-209 962, $6.75 in paper copy. Report M 72-45, March 1972. 265 p, 7 fig, 98 tab, 18 ref. EPA Project 1320. Contract F-19628-71-C-0002.

Descriptors: *Septic tanks, *Domestic wastes, *Aerobic treatment, Economics, Waste disposal, Sewage treatment, Economic efficiency, *Waste water treatment.

The full potential of individual home waste water treatment systems is not being realized because current system design, installation, and operational practices all of which have not changed substantially from past practices, do not reflect what is known about sewage-soil interactions. It is suggested that a controlled demonstration program will resolve important technological and institutional uncertainties. The reintroduction of individual home waste water treatment systems where applicable would result in a decrease of over $3 billion in the total cost of providing treatment to the new individual home population in the 1970-1990 period. (Smith-Texas)
W72-14864

IRRIGATION AND FERTILIZATION WITH WASTEWATER,
Idaho Univ., Moscow. Dept. of Civil Engineering; and Idaho Univ., Moscow. Dept. of Hydrogeology.
For primary bibliographic entry see Field 03F.
W72-14878

WATER BROUGHT TO HIGHWAY REST AREA THE 'HARD' WAY.
For primary bibliographic entry see Field 04B.
W72-14886

OMAHA'S PLATTE RIVER WATER TREATMENT PLANT,
Omaha Metropolitan Utilities District, Nebr.
A. Goodenkauf, and H. Hessler.
Public Works, Vol. 103, No. 7, p 70-72, July 1972. 2 photo.

Descriptors: *Water treatment, *City planning, *Water supply, *Management, Research and development, Decision making, Design, Long-term planning, *Nebraska, *Treatment facilities.
Identifiers: *Omaha (Neb), *Platte River, Split treatment method.

The 1968 completion of the Platte River Water Treatment Plant has assured that the city of Omaha, Nebraska will have an adequate water supply through 1980. Forward looking research, the acceptance of the research, decisions to proceed, and the actual design and construction have saved Omaha from a water crisis. Omaha has taken advantage of its situation on the Platte River. Some details are provided on the water treatment plant. There are 37 wells, 12 of which can use either gas engines or electric motors for pump drives. The pipe line from the well fields is divided as it enters the treatment section. This part of the plant is actually two separate and independent plants under one roof. Each half, having a capacity of 30 mgd, consists of three treatment basins, which can be operated in series, in parallel, or nearly any other combination. This arrangement permits two different procedures to be utilized at the same time for purposes of comparison. The chemicals which are primarily used are: lime, alum, and chlorine. The most efficient treatment to date is the split treatment method in which approximately half of the raw water is softened by lime, then blended with raw water which has been treated with potassium permanganate. The plant has eight filters, four on each half. All of the water produced in the plant is pumped into the city water system by one of four high service pumps. If a temporary power shortage should occur, the natural gas engines in the well field and in the high service can pump water. (Strachan-Chicago)
W72-14887

RECYCLING: A PAPER COMPANY'S APPROACH.
Limnos, Vol. 4, No. 2, p 15-17, Summer 1971. 4 photo.

Descriptors: *Recycling, *Reclamation, *Reclaimed water, *Water reuse, Waste disposal, Cooling water, Solvents, Water pollution control, Industries.
Identifiers: *Riverside Paper Corporation (Wis), *Polysolv, Paper making.

The Riverside Paper Corporation in Wisconsin is using a new patented process to convert waste milk cartons, waxed paper cups, poly-coated food packages, and ice cream cartons into fine, watermarked writing and printing paper. The Polysolv, a pulp wood fiber reclaiming system, permits 100% recovery and use of waste which might otherwise be incinerated or used as landfill. It reuses its cooling water over and over again, and the solvents are recovered, cleaned, and recirculated within the completely enclosed, pollution free system. Even the process byproducts - the residual waxes, adhesives, and plastics removed from the food board - are converted into a poly-wax fuel which helps to power the entire papermaking operation. (Strachan-Chicago)
W72-14888

PHYSICAL-CHEMICAL TECHNIQUES FOR TREATMENT OF RAW WASTEWATERS,
CH2M-Hill, Reston, Va.
G. L. Culp, and A. J. Shuckrow.
Public Works, Vol. 103, No. 7, p 56-60, July 1972. 1 tab, 5 fig, 12 ref.

Descriptors: *Waste water treatment, *Physical control, *Chemical analysis, *Biological treatment, Carbon, Performance, Costs, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: *Physical-chemical techniques.

Several of the approaches being recently investigated for application of physical-chemical unit processes to raw wastewaters are reviewed. These approaches have the common factors of chemical coagulation for efficient removal of suspended solids and/or phosphorus and use of activated carbon for removal of soluble organics with both granular and powdered activated carbons being investigated. Studies in Rocky River, Ohio; Cleveland, Ohio; Washington, D.C.; Salt Lake City, Utah; and Albany, New York are discussed. Such recent studies indicate that physical-chemical treatment of raw wastewaters offers performance advantages over biological treatment. Substantial savings in space and costs are predicted. The reactivation and reuse of granular carbon has been proven on a plant scale while techniques for regeneration of powdered carbon are still in the development stage. Not all organics found in municipal wastewaters are absorbable on carbon. The limitation on BOD and COD removal will depend on the quantities of these nonabsorbable materials present in a given wastewater. Generally, 90%-95% BOD and COD removal can be achieved. In most cases, biological treatment followed by physical-chemical treatment including carbon absorption will produce a higher degree of BOD and COD removal than physical-chemical treatment alone. Removals of 95-98% phosphorus and 99% suspended solids can be readily achieved with physical-treatment alone. Preliminary cost estimates indicate that efficient physical-chemical treatment, including phosphorus removal, can be achieved at a total cost of $0.18-$0.26/1000 gallons. (Strachan-Chicago)
W72-14890

AN ADVANCED WASTEWATER TREATMENT PLANT CAN PROVIDE REVENUE,
J. C. Hild.
Public Works, Vol 103, No 7, p 49-50, July 1972. 4 photo.

Descriptors: *Waste water treatment, *Water supply, *Economics, *Costs, Tertiary treatment, Funding, Monitoring, Water quality control.
Identifiers: *Montgomery County Fresh Water Supply District No. 2 (Texas).

The Montgomery County Fresh Water Supply District No. 2 (Texas) has found a way to insure wastewater treatment to meet tomorrow's needs by installing a large but advanced plant and selling the excess capacity to neighboring districts. The plant started operation in October, 1971. It is the first tertiary treatment plant built in Texas. The secondary stage employs the contact-stabilization modification of the activated sludge process, which provides mzximum treatment in a minimum area. The tertiary step involves gravity filtration through layers of anthracite and sand. The plant is a factory-built field-erected system. Within two months of the commencement of the plant's operation, there were buyers for 700,000 gpd of the plants 1 mgd capacity. This sale produced $308,000 of revenue which will go a long way towards defraying the cost of $400,000 for equipment, land, engineering, and legal fees, and the $800,000 towards 9.2 miles of trunk lines. Other funds have come from a $600,000 Environmental Protection Agency grant and from the District's $165,000 bond sale at an unusually high municipal rate of eight percent. Monitoring of the effluent, which is claimed to be the cleanest wastewater effluent in Texas, is accomplished by instrumentation of key parameters of plant operation. (Strachan-Chicago)
W72-14897

RECONDITIONING OF FOOD PROCESSING BRINES.
National Canners Association, Berkeley, Calif. Western Research Lab.

Copy available from GPO Sup Doc, $0.75; microfiche from NTIS as PB-212 394, $0.95. Environmental Protection Agency Water Pollution Control Research Series, March 1971. 76 p, 5 fig., 26 tab, 6 ref. EPA Program 12060 EHU 03/71.

Descriptors: *Brines, *Canneries, *Activated carbon, *Reclaimed water, *Brine disposal, Industrial waste, *Waste water treatment, Capital costs, Cost comparison, Waste treatment.
Identifiers: *Olive brines.

Activated carbon was used to treat storage brines and processing waters obtained from the production of canned ripe olives and glass packed green olives. Reconditioned brines were evaluated for reuse potential. Freshly harvested olives can be stored for commercially significant periods in reconditioned storage brines. Olives stored in reconditioned brine were of good quality. There was no detectable effect on final product quality with the reuse of reconditioned brines of lower salt content. When capital costs are amortized over 10 years for a cannery storing 5,000 tons of olives annually, estimates for commercial application of activated carbon treatment of storage brines show a cost per ton of olives stored of activated carbon treatment of storage brines show a cost per ton of olives stored of $3.64. Ten olive canneries sending spent carbon to a centrally located reactivation facility would have a cost of $1.28 per ton of olives stored. (Smith-Texas)
W72-14919

LEAD-DEADWOOD SANITARY DISTRICT NUMBER 1, SOUTH DAKOTA (FINAL ENVIRONMENTAL STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.

Available from the National Technical Information Service as PB-204 669-F, $3.00 in paper copy. March 15, 1972. 116 p, 6 fig, 2 map, 2 tab.

Descriptors: *South Dakota, *Environmental effects, *Waste treatment, *Waste water (Pollution), Sewage treatment, Aeration, Oxidation, Ultimate disposal, Municipal wastes, Industrial wastes, Mine wastes, Sewage, Sewage bacteria, Streams, Stream improvement, Water pollution treatment, Rivers, Groundwater, Wells, Water pollution control, Water quality control, Treatment facilities, Stream flow, Benefits.
Identifiers: *Environmental Impact Statements, *Lead-Deadwood (S Dak).

The proposed project will combine all municipal and industrial wastes from Lead and Deadwood, South Dakota, in one interceptor pipeline and convey the waste to a tailings-stabilization pond at Centennial Prairie for treatment by detention and bacterial action. A regional waste treatment pond, capable of 13,300 acre-feet of volume storage will be constructed to contain tailing storage for 20 years. The flow in Whitewood Creek, presently a mixture of raw sewage and industrial waste, will be transformed into a clear running stream. This improvement will also be evident in the Belle Fourche River, the Cheyenne River, and ultimately the Cheyenne Arm of Oahe Reservoir. The groundwater quality along the entire length of the affected streams is also expected to be improved. Some wells and springs immediately down valley from the project could experience a reduction of groundwater flow. The potential exists for groundwater contamination if the tailings-stabilization pond is not properly sealed to contain toxic wastes. Approximately 600 acres of land will ultimately be removed from agricultural use. Various alternatives considered were found less feasible than the proposed project. (Ellis-Florida)
W72-14924

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AFB FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.

Available from the National Technical Information Service as PB-207 733-D, $3.00 in paper copy. Report AF-ES-72-8D, March 1972. 122 p, 9 fig, 2 map, 8 tab, 10 append.

Descriptors: *Florida, *Environmental effects, *Waste water treatment, *Water quality control, Treatment facilities, Leases, Septic tanks, Industrial waste, Domestic wastes, Wildlife habitats, Land use, Air pollution, Water quality, Waste treatment, Lagoons, Wildlife ecosystems, Political aspects, Benefits, Costs, Feasibility, Federal government, Municipal wastes, Local governments.
Identifiers: *Environmental Impact Statements, *Tyndall AFB (Fla).

The proposed project involves the outlease of 150 acres of land on Tyndall Air Force Base, Florida, in the area of Military Point to Bay County, Florida. The land will be used for the construction and operation of secondary wastewater treatment facilities for four municipalities and two industries. Under the proposed treatment plan the water quality of St. Andrew Bay will be improved since the current primary treatment system will be bolstered by the addition of a secondary treatment capability. Land use by the proposed facility will eliminate wildlife habitation as long as the facility exists. The displacement of wildlife from the site and the presence of an industrial facility will have some disruptive effect on the ecosystem of the surrounding area, but it will be minor. It appears that the proposed action will have no significant adverse effect on air or water quality. The alternatives considered include location at other sites within Bay County, location on the International Paper Company plant site, a separate regional system for domestic waste with a treatment facility at some other site within the county, and use of other treatment processes. (Ellis-Florida)
W72-14928

EVOLVING SOCIAL ATTITUDES ON POLLUTION CONTROL,
Cincinnati Univ., Ohio. Environmental Health Engineering.
For primary bibliographic entry see Field 05G.
W72-14936

WATER TREATMENT APPARATUS,
Societe d'Etudes Chimiques pour l'Industrie et l'Agriculture, Paris (France).
For primary bibliographic entry see Field 05F.
W72-14967

TREATMENT OF SEWAGE,
South African Inventions Development Corp. (assignee).
P. G. J. Meiring, and P. H. Huisman.
U. S. Patent No. 3,579,439, 2 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 886, No 3, p 594, May 18, 1971.

Descriptors: *Patents, Treatment, *Sewage treatment, *Activated sludge, *Aeration, *Waste water treatment, Pollution abatement, Water pollution, *Nitrates, *Nitrogen, *Biochemical oxygen demand.

Raw sewage is mixed with activated sludge by agitation. A portion of the contents of the agitated substances is led into a separate settling zone where settled sludge is removed. The remainder of the substance in the agitation zone is directed to an aeration zone. The nitrogen content of the final effluent is controlled. (Sinha-OEIS)
W72-14968

SEWAGE TREATMENT SYSTEM,
Tesco Chemicals, Inc., Atlanta, Ga. (assignee).
W. E. Bradley, Jr.
U. S. Patent No. 3,579,440, 3 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 886, No 3, p 595, May 18, 1971.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Aerobic treatment, *Chlorine, *Biological treatment, Equipment, Pollution abatement, Water pollution, Water pollution treatment.

Waste water is treated in two stages: an aerobic biological decomposition stage, and a purifying stage. Wastewater is ducted into the biological decomposing chamber and eventually ducted into a second chamber where chlorine is mixed with the waste water and after a retention period is allowed to flow into a field or towards a stream. (Sinha-OEIS)
W72-14969

COMBINED WASTE TREATMENT AND GROWTH CHAMBER PROCESS,
Microphor, Inc., Willite, Calif. (assignee).
R. E. Burton.
U. S. Patent No. 3,577,678, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 159, May 4, 1971.

Descriptors: *Patents, *Liquid waste treatment, *Aerobic conditions, Carbon dioxide, Oxygen, Greenhouses, *Photosynthesis, Plant growth, *Waste water treatment, Pollution abatement, Water pollution, Water pollution treatment.
Identifiers: *Aerobic microorganisms.

A liquid waste treatment system and a growth chamber (a conventional greenhouse) are combined for commercial growth of valuable plants. Carbon dioxide-enriched air formed as a byproduct of the activities of aerobic microorganisms and the evaporating water in the liquid waste treatment system are introduced into the growth chamber where the carbon dioxide and water vapor are converted to oxygen during photosynthesis. The oxygen-enriched air is recycled from the growth chamber to the waste treatment system. (Sinha-OEIS)
W72-14972

WATER TREATMENT,
Pennwalt Corp., Warminster, Pa. (assignee).
For primary bibliographic entry see Field 05F.
W72-14973

PROCESS FOR PURIFICATION OF OIL PRODUCTION WASTE WATER,
Signal Companies. (assignee).
J. Duffy.
U. S. Patent No. 3,576,738, 3 p, 3 fig, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 885, No 4, p 814, April 27, 1971.

Descriptors: *Patents, *Oil wastes, Oily water, Oil industry, Equipment, Treatment, Oceans, Sea water, *Waste water treatment, Industrial wastes, *Oil pollution, Pollution abatement, Water pollution, Water pollution treatment, *Hydrogen sulfide, Sulfides.
Identifiers: *Chemical treatment.

Sulfide removal is combined with the flotation oil clean-up process by injecting an oxidation catalyst, i.e., a soluble nickel compound, into the waste water during aeration and providing sufficient additional air into the pump discharge to cause rapid oxidation of the hydrogen sulfide in the flotation cell separation. Three examples are cited. It is recommended that at least 0.05 standard cubic feet of air per barrel and about 0.5 to 1.0 ppm of the soluble nickel compound be introduced to cause catalytic oxidation of the sulfide to elemental sulfur. (Sinha-OEIS)
W72-14977

METHOD AND APPARATUS FOR SEWAGE TREATMENT,
J. R. Kaelin.

U. S. Patent No. 3,573,203, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 884, No 5, p 1392, March 30, 1971.

Descriptors: *Patents, *Sewage treatment, *Aeration, *Waste water treatment, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Activated sludge.

A single tank is used for the treatment process. A rotatable aeration wheel floating in the sewage is intermittently operated and shut down to allow aeration and circulation to alternate with a settling period. After the sludge settles to the bottom, the clarified liquid is withdrawn from the upper portion of the tank and the sludge may be separately treated. (Sinha-OEIS)
W72-14978

APPARATUS FOR SURFACE AERATION AND CIRCULATION OF LIQUID,
J. R. Kaelin.
U. S. Patent No. 3,576,316, 5 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 885, No 4, p 717, April 27, 1971.

Descriptors: *Patents, Sewage treatment, *Waste water treatment, Equipment, *Rotors, *Aeration, Water pollution, Water pollution treatment, Pollution abatement.

A rotor is partially submerged in the sewage and is able to rotate about a central vertical axis. The liquid sewage rises through various openings and rises in the central passageway. Centrifugal force develops in the flow passageway and the liquid is discharged into the tank and circulates carrying oxygen with it. A hollow space around the rotor is filled with a light-weight synthetic foam material. The buoyancy of the rotor creates a force which acts in opposition to the weight of the rotor. (Sinha-OEIS)
W72-14979

WASTE WATER TREATMENT,
Betz Labs., Inc., Trevose, Pa.
P. J. Gaughan, C. A. Noll, and J. K. Brown.
U. S. Patent No 3,575,853, 9 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 595, April 20, 1971.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Pollution abatement, *Flocculation, *Filtration, Acidification, Metals, Alkalinity, Water pollution, Water pollution treatment.

Waste water is acidified and passed through a unit containing a bed of metal particles. It is then moved into a mixing tank before being directed into a flocculating tank where the water is brought to an alkaline pH. Insoluble precipitates are formed and these are separated from the solution by deposition followed by filtration. Seventeen examples are reported. (Sinha-OEIS)
W72-14981

METHOD FOR TREATING WASTE WATER CONTAINING DISSOLVED PHOSPHATES,
American Colloid Co., Skokie, Ill. (assignee).
J. Hughes.
U. S. Patent No 3,575,852, 3 p, 2 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 595, April 20, 1971.

Descriptors: *Patents, *Phosphates, *Sewage treatment, *Detergents, Water pollution, Water pollution treatment, *Municipal wastes, *Domestic wastes, Separation techniques, Pollution abatement, *Waste water treatment.

Phosphates are removed from sewage waste water by using a mixture of lime and a cation exchange material having an exchange capacity at least 20 milli-equivalents per 100 grams of cation exchange material. The amount of lime (CaO) or (Ca (OH)2) (between 50% to 90% by weight), is based on the amount of cation exchange material and lime. The phosphate is precipitated as insoluble phosphate salts. The cation exchange material is an aluminosilicate clay mineral, preferably montmorillonite. The montmorillonite has replaceable calcium ions. (Sinha-OEIS)
W72-14982

METHOD AND APPARATUS FOR TREATING WASTE MATERIALS,
FMC Corp., San Jose, Calif. (assignee).
R. Davidson, F. F. Sako, W. G. Palmer, and R. A. Fisher.
U. S. Patent No 3,575,850, 4 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 594, April 20, 1971.

Descriptors: *Patents, *Aeration, *Filtration, Equipment, *Waste water treatment, Pollution abatement, Water pollution, Water pollution treatment.

The apparatus includes an aeration tank, a perforated drum mounted for at least partial submergence in the liquid sewage, a screen (filter) on which solids accumulate, a device to remove the solids from the screen, and an outlet for discharge of the clarified liquid. (Sinha-OEIS)
W72-14983

BIOLOGICAL TREATMENT OF WASTEWATER,
W. N. Torpey.
U. S. Patent No 3,575,849, 6 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 594, April 20, 1971.

Descriptors: *Patents, *Biological treatment, *Aerobic treatment, *Waste water treatment, Pollution abatement, Equipment, Separation techniques, Water pollution, Water pollution treatment, Slime, Sludge, Biochemical oxygen demand.

Biological slimes are grown on the surface of rotating discs by alternately immersing them in the wastewater for bioextraction of nutrients and exposing them to the atmosphere for absorption of oxygen. The solids (slime) settle through the subjacent zone and settle to the bottom of the tank and can be easily removed. (Sinha-OEIS)
W72-14984

PROCESS FOR PURIFYING WATER CONTAINING OIL AND SOLIDS,
D. K. Beavon.
U. S. Patent No 3,574,329, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 885, No 2, p 244, April 13, 1971.

Descriptors: *Patents, *Water purification, *Oily wastes, *Oily water, Equipment, *Waste water treatment, Oil pollution, Pollution abatement, *Aeration, Ponds, *Filtration, Water pollution, Water pollution treatment.
Gravity separation.

Water containing oil and solids is passed through a granular filter media fine enough to trap solids and leave the oil and water mixture to separate into oil and water layers. The entrained solids are removed from the filter by backwashing with water. The water recovered from the gravity separation and the backwash is returned to the system for use or oxidized biologically in a surface aeration pond before disposal. (Sinha-OEIS)
W72-14987

AERATION TANK FOR WASTE TREATMENT,
Mitsubishi Kokoki Kaisha Ltd., (Japan). (assignee).
K. Kurosawa, and M. Nakashio.
U. S. Patent No. 3,574,331, 4 p, 10 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 885, No 2, p 244, April 13, 1971.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Settling basins, Oxygen, Water treatment, Pollution abatement, Equipment, *Waste treatment.
Identifiers: Settling tanks.

The throughput of an aeration unit can be increased if the initial contact between gaseous oxygen and the waste material is made at hydrostatic pressures of not much less than 9 p.s.i.g. as is possible in this open, vertically elongated aeration tank. The tank has an effective height of more than 6 meters between the supply level at which the oxygen-bearing gas normally enters the tank and the upper liquid level in the tank. The aeration tank is connected by a conduit to a settling tank, so that gas-treated waste material may be transferred to the settling tank. (Sinha-OEIS)
W72-14988

PROCESS OF CLARIFYING A LIQUID USING SCORCHED NEWSPRINT,
Environmental Sciences, Inc., Berkeley Heights, N.J. (assignee)
S. Boorujy.
U. S. Patent No 3,574,098, 2 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 885, No 1, p 185, April 6, 1971.

Descriptors: *Patents, *Tertiary treatment, *Waste water treatment, *Filtration, *Sewage treatment, *Aerobic treatment, Aeration, Pollution abatement, Equipment, Separation techniques, Water pollution, Water pollution treatment, Biochemical oxygen demand.
Identifiers: *Newsprint, *Newspaper.

Waste newsprint is processed for use in cleaning sewer water having biological oxygen demand. The finely-ground, de-oiled newsprint scorched to a brown color is added to the waste water. The mixture is passed through a filter medium. The filter medium is vented to the atmosphere. The pressure of the water in the tank causes penetration of the filter media and central core, and the clarified water enters a discharge funnel from which it may be disposed into a river or stream. (Sinha-OEIS)
W72-14990

PROCESS FOR REDUCTION OF WATER POLLUTION DUE TO DOMESTIC AND INDUSTRIAL WASTES,
Fort Howard Paper Co., Greenbay, Wis. (assignee).
J. T. Sobota, and D. F. Pagel.
U. S. Patent No 3,573,202, 4 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 884, No 5, p 1391, March 30, 1971.

Descriptors: *Patents, *Pulp wastes, *Pulp and paper industry, Pollution abatement, *Biological treatment, *Lime, Activated sludge, *Aeration, Water pollution, Water pollution treatment, *Waste water treatment, Biochemical oxygen demand.
Identifiers: *Chemical treatment.

The process is divided into two stages to produce a modified primary-secondary sludge which has a consistency of 20-25% solids and a liquid effluent from the secondary stage which is 85-95% free of pollutants resulting in a 7 to 20 fold decrease in pollutants. Lime and stabilized secondary sludge are added to the wastes to form an aqueous mixture. The mixture is held in a retention basin long enough to separate the mixture. The supernatant is withdrawn for deposit in an aeration basin where it forms an activated sludge mixture. The activated sludge is introduced into a secondary basin where separation produces a clear supernatant and bacterial slime. The resulting clear supernatant will

have a BOD load 85-95% lower than the primary supernatant. (SinhalOEIS)
W72-14992

FLOATING AERATOR,
Richards of Rockford, Inc., Ill. (assignee).
R. B. Ravitts.
U. S. Patent No 3,572,658, 4 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 884, No 5, p 1270, March 30, 1971.

Descriptors: *Patents, *Aeration, *Aerobic treatment, *Waste water treatment, Water treatment, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Ponds.

The floating aerator is designed for use in a waste treatment pond. It serves to scrub and oxidize the water by drawing the water upward and slinging it into the surrounding atmosphere for contact with the air before falling back to the surface of the pond. Extending vertically through the center of the float is a cylindrical opening into which is telescoped an upright tabular throat defining a passage for the flow of water. The bottom of the throat is submerged and its upper end is open and reaches above the float so as to discharge the water into the atmosphere. (Sinha-OEIS)
W72-14993

UNDERWATER STORAGE TANK,
Secretary of the Interior, Washington, D.C.
W. J. Bandy, Jr., W. K. E. Morris, and G. M. Stainbrook.
U. S. Patent No 3,572,506, 5 p, 10 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 884, No 5, p 1233, March 30, 1971.

Descriptors: *Patents, *Storage tanks, *Storm water, Storage, Sewage, Sewers, Pollution abatement, Underwater, *Waste water treatment, Odor control.

A hollow framed storage tank which can be anchored on the bottom of a body of water is connected to a sewage system. The tank has vent valves for the escape of gases which may evolve from the sewage. The pipes of the metal framework include jets which are connected to a source of liquid under pressure which can be used for flushing the tank. The invention relates in general to the temporary underwater storage of liquids such as sewage which would otherwise overflow the sewer system during storms. (Sinha-OEIS)
W72-14994

APPARATUS FOR TREATING MUDDY WATER,
Kurita Water Industries Ltd., Yokohama (Japan); and Takenaka Komuten Co. Ltd., Yokohama (Japan). (assignees).
For primary bibliographic entry see Field 05F.
W72-14995

METHOD OF TREATING WASTE MATTER,
Tekmar Corp., New York. (assignee).
J. M. Valdespino.
U. S. Patent No 3,567,633, 3 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 884, No 1, p 294, March 2, 1971.

Descriptors: *Patents, Solid wastes, *Waste treatment, *Liquid wastes, Chlorine, Separation techniques, Equipment, Pollution abatement, *Neutralization, *Bacteria, Water pollution, Water pollution treatment, *Waste water treatment.

The method includes the steps of first separating the solid waste from the liquid waste and treating each independently. The solid waste is incinerated. The liquid waste is introduced into an auxiliary tank and treated with a neutralizing agent to destroy bacteria. Chlorine is suggested as the neutralizing agent. To discharge the liquid waste, air under pressure is forced through an air line into the sump and the build-up of air pressure within the sump will close a check valve to prevent the escape of air pressure through the drain. The built up pressure will force the liquid downward into a discharge pipe. (Sinha-OEIS)
W72-14997

5E. Ultimate Disposal of Wastes

REST AREA WASTEWATER DISPOSAL,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-14382

ECONOMICS OF HATCHERY SALMON DISPOSAL IN OREGON,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 06C.
W72-14423

HYDROGEOLOGIC FACTORS IN PROBLEMS OF CONTAMINATION IN ARID LANDS,
Nevada Univ., Las Vegas. Desert Research Inst.
For primary bibliographic entry see Field 05B.
W72-14508

CURRENT VELOCITIES IN THE VICINITY OF THE GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT'S IONA ISLAND OUTFALL - 1968,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 05B.
W72-14657

INDUSTRIAL FEASIBILITY OF MANMADE ISLANDS CONSTRUCTED FROM THE OFFSHORE DISPOSAL OF DREDGED SPOIL,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 05C.
W72-14662

AIR OXIDATION OF ORGANIC COMPOUNDS IN AQUEOUS SYSTEMS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05D.
W72-14836

WASTE TREATMENT AT A SYNTHETIC DRUG FACTORY IN INDIA,
Central Public Health Engineering Research Inst., Nagpur (India).
G. J. Mohanrao, P. V. R. Subrahmanyam, S. B. Deshmukh, and S. Saroja.
Journal, Water Pollution Control Federation, Vol 42, No 8, August 1970, p 1530-1543. 7 fig, 9 tab, 11 ref.

Descriptors: *Waste water treatment, *Neutralization, *Chemical treatment, *Biological treatment, Bioassay, Waste treatment, Effluents.
Identifiers: Drug factory, *Hyderabad (India), *Synthetic drugs.

This is the case history of an investigation to determine the best method or methods to use in dealing with the waste effluent from a synthetic drug factory in Hyderabad, India. The plant was divided into several units on the basis of waste effluent type from each unit. Treatment of part of the wastes entailed neutralization of the effluent and discharging into sewers. Chemical treatment, and biological treatment were used for the remaining portion. (Smith-Texas)
W72-14848

5F. Water Treatment and Quality Alteration

MICROBIOLOGY-DETECTION AND OCCURRENCE OF VIRUSES,
National Environmental Research Center, Cincinnati, Ohio.
G. Berg.
Journal Water Pollution Control Federation, Vol. 44, No. 6, p 1193-1198, June 1972. 50 ref.

Descriptors: *Methodology, *Viruses, *Pollutant identification, *Coliforms, Water pollution sources, Bioindicators, E. coli, Shellfish, *Filtration, Isolation, Sewage, Microorganisms, Laboratory equipment, Public health, Bacteriophage, Waste water (Pollution), Effluents, Efficiencies, Water pollution.
Identifiers: *Virus removal, Mercenaria mercenaria, Poliovirus, Echovirus, Reovirus, Coxsackievirus, Membrane filtration, Membrane filters, Blue-green algal viruses, Enterovirus.

A literature review is presented which deals with the methods of viral removal from large volumes of water, wastes, and shellfish. Of all the methods employed for viral removal, filtration techniques have been most extensively studied. Membrane filtration techniques involve the use of cellulose-nitrate membrane filters, adsorption onto collodion membranes, aluminum hydroxide-cellulose nitrate filters and alginate membranes. Some of the viruses isolated by these techniques are polioviruses, echoviruses, coxsackieviruses, and coliphage T3. (Long-Battelle)
W72-14305

SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 05G.
W72-14377

REGIONAL WATER SUPPLY AND WASTEWATER DISPOSAL PLAN AND PROGRAM, CAPITAL DISTRICT REGION.
Male (C. T.) and Associates, Schenectady, N. Y.
For primary bibliographic entry see Field 06B.
W72-14445

COMPREHENSIVE WATER AND SEWERAGE STUDY.
San Joaquin County Advisory Planning Association, Stockton, Calif.
For primary bibliographic entry see Field 06A.
W72-14447

FAIL-SAFE WATER PURIFYING APPARATUS,
Puretest Water Purifying Co. (Assignee).
R. W. Hippen.
U. S. Patent No. 3,652,520, 4 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 799, February 9, 1971.

Descriptors: *Patents, *Water purification, *Water treatment, Pollution abatement, Equipment, *Bacteria, *Ultraviolet radiation, Light, *Microorganisms.

An elongated tubular electric lamp provides a source of ultraviolet illumination. A transparent protective filiform cylinder surrounds the lamp. A wiper keeps the equipment clean. (Sinha-OEIS)
W72-14456

SAND FILTER FOR WATER PURIFICATION,
For primary bibliographic entry see Field 05D.
W72-14461

WATER TREATMENT FACILITIES, FOSS RESERVOIR, CUSTER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Fort Worth, Tex. Region VI.

Available from the National Technical Information Service as PB-204 460F. $3.00 in paper copy, $0.95 in microfiche. March 29, 1972. 77 p, 1 map, 5 tab.

Descriptors: *Environmental effects, *Water treatment, *Treatment facilities, *Turbidity, Waste water disposal, Waste water (Pollution), Water supply, Water demand, Water quality, Water quality control, Flow augmentation, Demineralization, Desalination, Pre-treatment (Water), Desalination wastes, Environmental engineering, Water pollution sources, Fish, Waterfowl, Water resources development, Water management (Applied), Water utilization, Oklahoma.
Identifiers: *Environmental Impact Statements, Custer County (Okla), Washita River, *Foss Reservoir (Okla).

The project consists of the construction of a water treatment plant to remove turbidity by chemical clarification and minerals by a demineralization process located at the Foss Reservoir, Oklahoma. An assured source of good quality water would be provided by the project. Furthermore the quality of water in the reservoir would be expected to improve due to withdrawal of water from the reservoir. Wastewater from the plant would increase the flow in the Washita River below the dam. Increased flow will benefit fish and waterfowl habitats, recreational potential, and will also eliminate stagnation. Total dissolved solids in the river downstream from the plant would increase due to the discharge of wastewater. However, it would appear that the benefits due to increased flow would substantially outweigh the detrimental effects of the dissolved solids. The quality of the river water would only be slightly affected by the releases from the desalination plant. Alternatives considered include construction of pipelines to supply water, construction of dams, drilling of wells or no action at all. Brief comments from other agencies are included. (Brackins-Florida)
W72-14563

BACTERIOLOGICAL CONTROL OF PURIFICATION SYSTEMS AND RECEIVING WATERS WITH THE USE OF A MEMBRANE FILTER AND A DIAPHRAGM FILTER, (BAKTERIOLOGISCHE KONTROLLE VON KLARANLAGEN UND VORFLUTERN MITTELS MEMBRANFILTER UND NAHRKARTONSCHEIBEN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
For primary bibliographic entry see Field 05D.
W72-14666

A METHOD OF DEMINERALIZATION USING STRONGLY ION EXCHANGE RESINS,
New Mexico State Univ., University Park. Engineering Experiment Station.
For primary bibliographic entry see Field 03A.
W72-14679

ADSORPTION CHARACTERISTICS OF COALS AND CHARS,
Pennsylvania State Univ., University Park. Dept. of Material Sciences.
For primary bibliographic entry see Field 05D.
W72-14814

WATER TREATMENT APPARATUS,
Societe d'Etudes Chimiques pour l'Industrie et l'Agriculture, Paris (France).
R. Jurion, and A. Leblanche.
U. S. Patent No. 3,578,005, 5 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 886, No 2, p 255, May 11, 1971.

Descriptors: *Patents, *Bromine, *Bactericides, *Algicides, *Water treatment, Water purification, Water quality, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Wastewater treatment.

A mixing device for a water treatment apparatus is described in which liquid bromine is prepared for introduction into the water to be treated. The device comprises at least one storage vessel for containing the liquid bromine and a dilution vessel connected to it. Control valves are used to regulate flow between the vessels and finally into the water to be treated. (Sinha-OEIS)
W72-14967

WATER TREATMENT,
Pennwalt Corp., Warminster, Pa. (assignee).
F. W. Keith, Jr., E. M. Jones, and J. R. Townsend, Jr.
U. S. Patent No. 3,577,341, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 100, May 4, 1971.

Descriptors: *Patents, *Water treatment, *Pollution abatement, Water pollution treatment, Sedimentation separation techniques, Water quality, Lime, Carbon, Chlorine, *Flocculants, Waste water treatment.
Identifiers: *Chemical additives, Potassium permanganate, Aluminum sulfate, Ferric sulfate, Sodium hydroxide, Soda ash.

Raw water is mixed with one or more additives and then fed to a settling zone where sedimented material is separated from the water. The separated water is passed through a filtration zone. The sedimented material is centrifugally concentrated for disposal in compact form. The filtered water may be recycled or led out of the system as required. (Sinha-OEIS)
W72-14973

APPARATUS FOR TREATING MUDDY WATER,
Kurita Water Industries Ltd., Yokohama (Japan); and Takenaka Komuten Co. Ltd., Yokohama (Japan). (assignees).
M. Endo, T. Kawasaki, M. Miura, Y. Ikuta, and M. Suzuki.
U. S. Patent No 3,570,670, 4 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 884, No 3, p 895, March 16, 1971.

Descriptors: *Patents, *Mud, *Dewatering, Separation techniques, Equipment, Pollution abatement, Drainage engineering, *Water treatment, Waste water treatment.

Muddy water is treated by processing through a vibrating screen, a separating tank, a hydraulic cyclone, a hopper and a mixer. The solid matter is cemented into massive lumps to be transported for disposal. (Sinha-OEIS)
W72-14995

SPECIALIZED HOLOGEN GENERATOR FOR PURIFICATION OF WATER,
National Aeronautics and Space Administration, Washington, D.C.
R. A. Bruce.
U. S. Patent No 3,574,084, 3 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 885, No 1, p 181, April 6, 1971.

Descriptors: *Patents, *Water purification, *Water treatment, *Halogens, Copper compounds, *Chlorine.
Identifiers: Copper chloride.

Purified water is obtained by providing a vessel having an electrolyte chamber, an anodic chamber and a water treatment chamber. A saturated solution of an electrolyte, such as copper chloride, is provided in the electrolyte chamber with a cathode immersed in this solution. An additional undissolved quantity of the solid electrolyte is added to the saturated solution of electrolyte. The anodic chamber is separated from the electrolyte chamber only by a hydrophilic membrane and the water treatment chamber is separated from the anodic chamber only by a hydrophobic membrane. When voltage is applied copper will be plated out at the cathode and chlorine at the anode. The chlorine passes through the hydrophobic membrane and into the water treatment chamber. (Sinha-OEIS)
W72-14998

5G. Water Quality Control

ECONOMIC VALUE OF WATER IN A SYSTEMS CONTEXT,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 06B.
W72-14236

THE ECONOMIC VALUE OF WATER: CONCEPTS AND EMPIRICAL ESTIMATES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-14237

HEARINGS--PUBLIC WORKS FOR WATER, POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATIONS FOR FISCAL YEAR 1973--PARTS 1-5.

Hearings--Subcomm of the Comm. on Appropriations, U.S. Senate, 92d Cong, 2d Sess, 1972. 5 parts, 7 vol.

Descriptors: *Federal budget, *Water resources, *Legislation, *Water pollution control, Environment, Waste water disposal, Transportation, Harbors, Flood control, Water supply, Grants, River basin commissions, Rivers, Thermal power, Tennessee Valley Authority, National Water Commission, Political aspects, Federal government, Electric power production, Water resources development, Environmental effects.
Identifiers: *Department of the Interior, *Atomic Energy Commission, *Corps of Engineers, Water Resources Council.

Included are the budgetary requests of various governmental agencies and departments for fiscal year 1973 relating to water, pollution control, and power development. The Army Corps of Engineers requested a record sum for civil works programs. Those programs include water resource planning and transportation as well as waste water management, ports and harbors, and flood control. Testimony on each of the numerous crop projects, their purpose, need, impact, and cost is included. The Department of the Interior request showed an increase in water resources development activities. Hearings were conducted on the requests of the Water Resources Council, the Bureau of Reclamation, the National Water Commission, the Tennessee Valley Authority, the Delaware River Basin Commission, the Susquehanna River Basin Commission, and others. The Atomic Energy Commission request included an increase in land and freshwater sciences research programs calling for additional emphasis on thermal studies. Also included are voluminous prepared statements of numerous witnesses concerning budgetary requests for various water resource projects throughout the Nation. (Ellis-Florida)
W72-14251

POWERPLANT SITING AND ENVIRONMENTAL PROTECTION, PART 2.
For primary bibliographic entry see Field 06G.
W72-14252

GATEWAY AREA PROPOSALS.
For primary bibliographic entry see Field 06G.
W72-14253

VERMONT WHEY POLLUTION ABATEMENT AUTHORITY LAW.

Vt. Pub. Acts No. 83 (1971).

Descriptors: *Vermont, *Legislation, *Industrial wastes, *Pollution abatement, Water pollution control, Waste disposal, Water law, Legal aspects, Watercourses (Legal aspects), State governments, Administrative agencies, Administration, Regulation, Control, Financing, Government finance, Eminent domain, Water quality, Water quality control, Water pollution sources, Waste treatment, Condemnation, Bond issues.
Identifiers: *Whey pollution.

Pollution of the waters of Vermont resulting from discharges of fluid whey and wash waters by cheese processors endangers public health. This act grants to a single state agency, the Vermont Whey Pollution Abatement Authority, the necessary powers in order to abate this pollution. The Authority has the power to issue bonds to finance the construction of projects designed for use as plants to process fluid and concentrated whey and wash water. The authority may charge and collect rents, fees and charges for the use of the project or its services or facilities. The act includes provisions dealing with the issuance of bonds and notes. In order to carry out the policy of this act the authority has the power of eminent domain. The authority may also enter into contracts for management and operation of a project. Provisions for examinations and monitoring enable the authority to enter upon such lands, waters or premises as may be necessary, convenient or desirable for the purpose of making soundings, borings and examinations. (Brackins-Florida)
W72-14255

ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING, AND MANAGING WATER RESOURCES IN AGRICULTURE.
Economic Research Service, Madison, Wis.
For primary bibliographic entry see Field 03F.
W72-14256

INTRODUCTION OF A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W72-14258

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS (DIGEST OF BILL).
For primary bibliographic entry see Field 06E.
W72-14259

NAVIGATION OF THE KANSAS RIVER, LAWRENCE TO THE MOUTH (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W72-14260

SMALL BOAT HARBOR, PORTSMOUTH STATE PARK, OHIO, OHIO RIVER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 04A.
W72-14261

SAN LEANDRO CREEK SMALL FLOOD CONTROL PROJECT, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08D.
W72-14262

SCITUATE HARBOR, SCITUATE MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14263

MAINTENANCE DREDGING, SCITUATE HARBOR, MASSACHUSETTS (DRAFT ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14264

DIKED DISPOSAL AREA PROGRAM, ONTONAGON HARBOR, ONTONAGON, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.

Available from the National Technical Information Service as PB-205 586-D. $3.00 in paper copy. November 24, 1971. 16 p, 1 plate, 4 tab, 2 append.

Descriptors: *Michigan, *Environmental effects, *Spoil banks, *Water quality control, Dredging, Water pollution sources, Water pollution effects, Turbidity, Odor, Aesthetics, Groundwater movement, Groundwater, Harbor dikes, Disposal, Lake Superior, Operation and maintenance.
Identifiers: *Environmental impact statement, *Ontonagon Harbor (Mich).

The project involves construction of a system of sand dikes west of the entrance to Ontonagon Harbor, Michigan, in order to contain polluted dredge spoil. The dikes will be less than 14 feet above mean low water, but high enough to prevent overtopping. The lakeward side of the dikes would be riprapped to prevent erosion. A settling basin will be provided to accomodate effluent water prior to discharge back into the harbor. Water quality defects will be detected by testing and treatment when necessary. Environmental inpacts include: prevention of polluted spoil contamination in open water of Lake Superior, raising the 20 acre disposal area level by 9 feet over a 10 year course of project life, some harbor turbidity during construction, and some temporary odor and unsightliness. Creation of the disposal sites would have no adverse effect on the groundwater or eco-system since the area is practically biologically sterile. Groundwater movement from the area is lakeward so any seepage would not impair groundwater quality. Alternatives include: continued in-lake disposal, cessation of maintenance dredging, alternative disposal sites, treatment of polluted soil, and modification of current methods and equipment to reduce water and polluted soil contact. (Grant-Florida)
W72-14270

DIKED DISPOSAL AREA PROGRAM, ASHLAND HARBOR, ASHLAND, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.

Available from th National Technical Information Service as PB-205 587-D. $3.00 in paper copy. November 24, 1971. 16 p, 1 map, 2 tab, 2 append.

Descriptors: *Wisconsin, *Lake Superior, *Spoil banks, *Environmental effects, Dredging, Channel improvement, Turbidity, Odor, Aesthetics, Eutrophication, Lake beds, Water pollution sources, Water pollution, Disposal, Harbors, Operation and maintenance, Dikes, Recreation, Vegetation effects, Bank erosion.
Identifiers: *Environmental impact statement, *Ashland Harbor (Wis.), *Dredge spoil.

The project involves the construction of a diked disposal area for containing polluted dredge spoil in Ashland Harbor, Wisconsin. The harbor is located on the south shore of Lake Superior. The site will cover approximately six acres. Dikes will be 14 feet above mean low water, but high enough to prevent overtopping. Outer banks will be riprapped to prevent erosion. A settling basin will accommodate effluent water discharged back into the harbor. Environmental effects of the project include: elimination of polluted spoil contamination in the open waters of Lake Superior, eventual raising of the level of the disposal area by 11 feet with loss of vegetation and recreational value of the area, loss of the covered marsh area, and improved lake water quality. Unavoidable adverse effects include: temporary turbidity, odor, and unsightliness; increased eutrophication of the lake bed in the disposal area; and loss of the limited recreation value of the site until vegetation is reestablished. Alternatives include: continued in-lake disposal, cessation of maintenance dredging, alternate disposal sites, treatment of spoil, delayed action pending pollution abatement in the area, and modification of methods and equipment to reduce water and soil contact. (Grant-Florida)
W72-14271

BLACK ROCK CHANNEL AND TONAWANDA HARBOR, NEW YORK (OPERATION AND MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 792-D. $3.00 in paper copy. November 1971. 11 p, 2 map, 1 dwg.

Descriptors: *New York, *Lake Erie, *Dredging, *Environmental effects, Channel improvement, Locks, Maintenance, Operation and maintenance, Canals, Water pollution sources, Water pollution, Spoil banks, Eutrophication, Downstream, Turbidity, Sedimentation, Disposal, Harbors.
Identifiers: *Environmental impact statement, *Tonawanda Harbor (New York), Dredge spoil.

The project under consideration is the periodic maintenance of channels and structures in the deep-draft navigation project for Black Rock Channel and Tonawanda Harbor, New York. Several structures in the project also require maintenance. Hopper dredges remove approximately 100,000 cubic yards of material annually. Spoil is placed in the spoil areas for Buffalo Harbor maintenance. Material from the canal between the lock and Buffalo Harbor is more polluted and is placed in a special area. Material from below the lock is dumped in an open-water area in Lake Erie. Environmental impacts of this maintenance include: some noise and dust during construction, short-term turbidity and sedimentation, and some increased pollution and eutrophication in the lake from nutrients in spoil deposits. Efforts have been made to reduce water pollution by use of the contained disposal area. The only adverse effect of open lake dumping is the removal of the polluted spoil from downstream areas to Lake Erie where there is already a severe pollution problem. There is no alternative to maintenance and lock operation. An alternative to lake disposal of spoil is construction of permanent disposal areas. Funds are available for this construction. (Grant-Florida)
W72-14272

ROCHESTER HARBOR, MONROE COUNTY, NEW YORK (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 796-D. $3.00 in paper copy. November 19, 1971. 11 p, 2 map, 1 illus, 1 dwg.

Descriptors: *New York, *Dredging, *Channel improvement, *Harbors, Rivers and Harbors Act, Channel morphology, Spoil banks, Lake Ontario, Navigation, Water pollution sources, Water pollution effects, Water quality, Sedimentation, Turbidity, Dissolved oxygen.
Identifiers: *Environmental impact statement, *Rochester Harbor, N.Y.

The work under consideration is the periodic maintenance of completed structures and channels in the deep-draft navigation project for the Rochester, New York harbor. Project features requiring maintenance are parallel piers as the mouth of the Genesee River, and dredged areas. 360,000 cubic yards of material are dredged annually and dumped into Lake Ontario in an area one and a half miles from shore. Environmental impacts resulting from this work include: noise and dust during the construction period, short term turbidity and sedimentation during dredging and dumping, some water quality impairment from sediment, and possible adverse effects to fish from algae and plant growth stimulated by increased oxygenation of spoil material. The only adverse effect is the fact that polluted material from the spoil is placed in Lake Ontario at a faster rate than it would naturally occur. The only feasible alternative is to dispose of spoil in an enclosed area. Funds are available for constructing such an area, and an environmental statement will be prepared. Maps showing alternative disposal sites are included. (Grant-Florida)
W72-14273

NEW BEDFORD AND FAIRHAVEN HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14277

CONFERENCE IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES--INDIANA-MICHIGAN-NEW YORK-OHIO-PENNSYLVANIA: VOLUMES 1 AND 2.
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14282

BENTHIC FAUNAL RECOVERY IN A SWEDISH FJORD FOLLOWING THE CLOSURE OF A SULPHITE PULP MILL,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
For primary bibliographic entry see Field 05C.
W72-14337

SUBSURFACE WATER TEMPERATURES OF THE COLUMBIA RIVER AT PRESCOTT, OREGON (RIVER MILE 72), 1968-69,
National Marine Fisheries Service, Seattle, Wash. Biological Lab.
G. R. Snyder, and R. J. McConnell.
Available from NTIS, Springfield, Va., 22151, as COM-71-00638. Price $3.00 paper copy; $0.95 microfiche. Data Report 53, February 1971. 9 p, 1 fig, 6 tab.

Descriptors: *Water temperature, *Basic data collections, *Columbia River, *Oregon, Pre-impoundment, Electric powerplants, Environmental effects, Ecology, Fish management, Forecasting, Thermal pollution, Water quality control.
Identifiers: *Prescott (Oreg).

Water temperature data from January 1968 through December 1969 are presented to aid in the evaluation of the effects of impending industrial encroachment on the existing fisheries of the lower Columbia River. Two thermal nuclear electric plants have been proposed by public and private utilities for installation on the lower Columbia River in this decade. Existing (preplant) temperature records are needed to establish and predict the changes that will take place in water temperature as a result of plant operations and the effect temperature increases will have on the aquatic ecology of the river. (Woodard-USGS)
W72-14357

HYDROLOGY OF WESTERN COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W72-14359

THE 1969 UPPER MISSISSIPPI RIVER DREDGE SPOIL SURVEY FROM HASTINGS, MINNESOTA TO CAIRO, ILLINOIS,
Missouri Dept. of Conservation, Jefferson City.
J. W. Robinson.
Available from NTIS, Springfield, Va. 22151, as COM 72-10044, Price $3.00 paper copy; 95 cents microfiche. Upper Mississippi River Conservation Committee, Fish Technical Section, December 1970. 157 p, 4 plate, 153 map.

Descriptors: *Dredging, *Spoil banks, *Environmental effects, *Ecology, *Mississippi River, *Sludge disposal, Navigation, Wildlife, Protection, Fish Conservation, Planning, Water quality control, Engineering.

The deposition of dredge spoil can cause changes in river environment to the detriment of fish and wildlife. Recommendations for dredge spoil disposal are made for the Upper Mississippi River from Mile O (junction with Ohio River) to mile 819 (above Hastings, Minnesota). General recommendations include: 1. Deposit spoil on some of the existing islands having a low value for timber and wildlife habitat. 2. Consider the construction of sand islands in the wide, flat lower ends of some pools. The principal advantages of such islands would be (1) reduction of wave action, (2) provisions of areas for wildlife, (3) better definition of the navigational channel, and (4) creation of additional recreation areas. 3. Develop sand beaches at state, county and municipal parks bordering the river. 4. Provide fill for proposed public access and parking areas sponsored by Federal and State programs. 5. Creat dikes in large shallow water areas for waterfowl and aquatic fur animal management. 6. Provide fill in lowland areas of little wildlife value adjacent to communities wishing to have additional space for industrial expansion or other purposes. (Woodard-USGS)
W72-14374

SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON,
Texas Univ., Austin. Center for Research in Water Resources.
E. G. Fruh, and F. D. Masch.
Available from the National Technical Information Service as PB-212 167, $3.00 in paper copy, $0.95 in microfiche. Technical Report CRWR-91, EHE 72-15, May 1972, 142 p., 39 fig, 29 tab, 39 ref. OWRR B-040-TEX (5).

Descriptors: *Water quality control, *Withdrawal, *Mathematical model, *Nutrients, Nitrogen, Velocity, Discharge measurement, Computer programs, *Texas, Temperature, Light, Mixing.
Identifiers: *Selective withdrawals, Bohen-Grace model, *Lake Livingston (Tex).

A methodology by which production could be made of the water quality released from relatively shallow but stratified Texas impoundments was developed. The Bohen-Grace model was satisfactory in predicting the thickness of the withdrawal zone and the magnitude of the velocity profile. Flow discharge profiles were estimated from the velocity profiles generated by the Bohen-Grace model. By measuring the water quality profile in the impoundment pool, predictions could be made for the water quality in the release. The methodology was evaluated by comparison of predicted and observed water quality for the releases from Lake Livingston under various reservoir operating conditions. Also, the water quality characteristics which were of significant importance to warrant a reservoir operating program based on selective withdrawal were determined. A three year field study with primary emphasis on nutrients was undertaken as Lake Livingston filled. Nitrogen was found to be the limiting nutrient while other environmental variables such as temperature, light, mixing and river inflow rate did not appear to control phytoplankton growth. Algal growth potential bioassays were also conducted. (Galwardi-Texas)
W72-14377

STUDIES ON OYSTER CULTIVATION IN THE DRAINAGE BASIN OF OSTEND (BELGIUM) DURING 1969,
Institut Royal des Sciences Naturelles de Belgique, (Belgium).
For primary bibliographic entry see Field 04A.
W72-14378

VERMONT WATER QUALITY SIMULATION PROJECT REPORT,
Thayer School of Engineering, Hanover, N.H.
For primary bibliographic entry see Field 05B.
W72-14392

SOME ENVIRONMENTAL FACTORS TO BE CONSIDERED IN THE DESIGN OF THERMAL POWER PLANTS IN THE NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
E. O. Salo.
The Trend in Engineering, Vol 21, No 4, p 3-7, 32, October 1969. 6 fig, 8 ref.

Descriptors: *Thermal pollution, *Thermal powerplants, *Ecology, Intakes, Outlets, Pacific Northwest U.S., Fouling, Cooling water, Chlorination, Temperature, Velocity, Heated water, Radioactive wastes, Slime.
Identifiers: Travel time.

Recent literature describing the environmental effects of existing thermal powerplants on the Pacific coast is reviewed, with considerations of intake and discharge design, velocity control, travel time, and the size and extent of influence of the heated water discharges and the discharge of low level radioactive wastes. The velocity of water from the intake through the condenser is usually 7-8 fps. Since the condenser tubes are 30-60 ft in length, the heating of water takes place in 4-9 sec. Water is heated about 15 to 25F at maximum generation load, and then is discharged at a rate that varies from 4-8 fps. For economic reasons and maintenance purposes, shoreline intakes are preferred by some companies. These allow for screening of large areas to decrease the intake velocities and facilitate cleaning of screens. A recent projection showed that the maximum effect of all 16972 Mw of power plant capacity in California tidal waters would be that a total of 5.86 square miles of surface water would be raised 2F above normal and a total of 0.41 square miles would be included in the 10rise isotherm. Fouling organisms and their control are discussed. (Upadhyaya-Vanderbilt)
W72-14394

COOLING TOWER PLUME RISE,
General Electric Co., Schenectady, N.Y. Energy and Environmental Programs.
D. H. Brown, and H. J. Sneck.
Proceedings of the American Power Conference, Vol 33, p 546-553, 1971. 5 fig, 2 tab, 7 ref.

Descriptors: *Cooling towers, *Buoyancy, *Air, *Heat transfer, *Temperature, Air entrainment, Air temperature, Heat, Momentum transfer, Model studies, Air pollution, Nuclear powerplants, Density stratification, *Thermal pollution.
Identifiers: *Plume rise, *Air buoyancy, Adiabatic lapse rate, Isentropic rise, Modeling criteria, Atmospheric inversion, Buoyant plumes.

From the parametric evaluation of plume rise with fixed initial conditions into a ground level atmospheric inversion it is found that both zero buoyancy altitude and maximum rise altitude are greatest when the entire thermal exhaust is concentrated in a single plume and not sub-divided into several plumes. The zero buoyancy plume rise is increased when the source has the greatest diameter and the least upward velocity. These plumes can be modeled in an atmospheric research facility. The means of integrating the basic relations from Morton, Taylor and Turner are presented as a more direct engineering approach than the extended consideration of forced plumes by Morton in actual applications; direct integration is mandated by the variation of atmospheric temperature gradient with altitude as well as consideration of condensation effects as in Morton. (Oleszkiewicz-Vanderbilt)
W72-14396

CHARACTERISTICS, CLASSIFICATION AND INCIDENCE OF PLUMES FROM LARGE NATURAL-DRAFT COOLING TOWERS,
Metropolitan Edison Co., Reading, Pa. Three Mile Island Nuclear Station.
G. F. Bierman, G. A. Kunder, J. F. Sebald, and R. F. Visbisky.
Proceedings of the American Power Conference, Volume 33, p 535-545, 1971. 4 fig, 6 ref.

Descriptors: *Cooling towers, *Density, *Air pollution, Evaporation, Buoyancy, Clouds, Meteorology, Statistics, Nuclear powerplants, Cooling water, Fallout, Analysis, *Thermal pollution.
Identifiers: *Plume rise, *Inversion, *Plume classification, *Natural draft towers, *Drift, Ground level meteorology, Plume penetration, Salt fallout.

It has been deduced that plume penetration of inversions and/or plume rise is in direct proportion to the diameter of the plume discharge section of evaporative cooling towers. The new tentative standard for cooling tower drift quantity of 0.03 percent of cooling water flow is a major improvement in relation to reducing the possible effects of salt fallout on the local ecology. The plume classification technique developed in conjunction with the Keystone and Three Mile Island studies has been useful in describing plume type, incidence, and characteristics. The Keystone studies indicate that there is a reasonable possibility of predicting, from published weather data, the nature and frequency of natural draft cooling tower plumes of the Category 1 type. Estimates of the nature and frequency of cooling tower plumes of the Category 2 type can be made from the incidence of inclement, low overcast weather based on published weather reports associated with the area under consideration. (Oleszkiewicz-Vanderbilt)
W72-14397

THERMAL DISCHARGES - AN OVERVIEW,
Sargent and Lundy, Chicago, Ill.
T. D. Kolflat.
Proceedings of the American Power Conference, Volume 33, p 412-426, 1971. 5 fig, 52 ref.

Descriptors: *Thermal powerplants, *Heat, *Environmental effects, *Legislation, *Cooling, *Cooling towers, Optimization, Performance, Cooling water, Costs, Beneficial use, Evaporation, *Thermal pollution, Heating, Heat transfer, Fossil fuels, Bibliographies.
Identifiers: *Heat rejection, *Heat utilization, Thermal steam cycle, Thermal efficiency, Central generation station, Natural draft, Forced draft, Dry air coolers, Cooling lakes, Surface cooling, Cooling cycles.

An overview of thermal discharges resulting from electric power generation has been presented, dealing with the source of the heat, the impact on the environment, beneficial uses of heat, related legislation, cooling devices, and cooling system arrangements and costs. The following conclusions were made: the highly developed thermal steam cycle is an efficient heat machine with a relatively small heat discharge per unit of generation and will be the major source for electrical demands. Total heat rejection to the environment from all prime movers could be reduced if a greater proportion of power generation were reallocated to the thermal steam cycle from other less efficient heat engines. Projected magnitudes of total heat rejection to the environment from all electric generation in the future are small compared with natural heat contributions, such as solar energy. For surface cooling less water surface area is affected with higher temperature thermal discharges. Optimization studies should be made of entire systems to ensure the most economic selection. The use of comparative cost generalizations of different cooling systems is extremely hazardous. Each specific installation should be analyzed by experienced personnel having direct and current exposure to the subject. (Oleszkiewicz-Vanderbilt)
W72-14399

ASSESSING TEMPERATURE EFFECTS WITH BIOLOGY,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Biological and Chemical Section.
For primary bibliographic entry see Field 05C.
W72-14401

COOLING WATER STRUCTURES FOR FITZPATRICK NUCLEAR PLANT,
Stone and Webster Engineering Corp., Boston, Mass.
R. W. Gunwaldsen, B. Brodfield, and G. E. Hecker.
Journal of the Power division, Proceedings of ASCE, Vol. 97, No. P04, Proc. Paper 8572, p 767-781, December 1971. 7 fig, 10 ref.

Descriptors: *Nuclear powerplants, *Discharge (Water), *Cooling water, *Lakes, *Model studies, Temperature, Structural design, On-site investigations, Intakes structure, Thermal powerplants, Hydraulic models, Discharge measurement, *New York, Thermal pollution.
Identifiers: *Thermal-hydraulic model, *Fitz-Patrick powerplant (NY), Discharge structure, Measuring stations, Diffuser nozzles.

To comply with New York State temperature criteria, the condenser cooling water of the James A. FitzPatrick Nuclear Power Plant, located on Lake Ontario, will be discharged through a submerged diffuser. The discharge structure will be located in an average water depth of 30 ft and will consist of six pairs of nozzles, each 2.5 ft in diameter connected by a riser to a tunnel excavated in bedrock under the lake bottom. The cooling water intake will be sector shaped and located shoreward of the line of nozzles. The design of intake and discharge structures are based on hydraulic model studies. Data for the model studies were obtained from surveys in the lake aimed at defining natural wind induced currents and temperature distributions. (Oleszkiewicz-Vanderbilt)
W72-14403

PREDICTING QUALITY EFFECTS OF PUMPED STORAGE,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 05C.
W72-14405

INFORMATION SOURCES ON WATER QUALITY INCLUDING THERMAL POLLUTION.

Journal of the Sanitary Engineering Division, Proceedings of ASCE, Vol. 98, No. SA3, p 569-578, June 1972. 3 ref.

Descriptors: *Water quality, *Thermal pollution, *Information retrieval, *Publications, Abstracts, Documentation, Bibliographies, Reports, Sanitary Engineering, Water pollution, Indexing.

The Thermal Pollution Committee of ASCE's Sanitary Engineering Division has made an in-depth investigation of the new literature on thermal pollution, of methods for efficient retrieval, and of the forms in which the data are available. A number of competent information retrieval systems and abstracting services have been established. Comprehensive coverage of retrieval systems containing information on thermal pollution is presented in this report. These data include location of the retrieval, how they can be used, approximate costs, the format in which data are made available, and whom to contact. Sources include a list of retrieval systems, Water Resources Scientific Information Center, National Technical Information Service, Smithsonian Institute's Science Information Exchange, National Aeronautics and Space Administration, Atomic Energy Commission, National Referral Center of the Library of Congress, Tennessee Valley Authority, Department of Army Waterways Experiment Station, American Water Resources Association, Engineering Societies Library, Engineering Index, Inc., and Edison Electric Institute. (Eagle-Vanderbilt)
W72-14406

ENERGY USE IN CALIFORNIA: IMPLICATIONS FOR THE ENVIRONMENT,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 05C.
W72-14408

SIGNED DIGRAPHS AND THE GROWING DEMAND FOR ENERGY,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 06D.
W72-14411

WATER CONSUMPTION STUDY FOR NAVAJO PLANT,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
P. Leung, and R. E. Moore.
Journal of the Power Division, Proceedings of ASCE, Vol. 97, No. P04, Proc. Paper 8564, p 749-766, December 1971. 5 fig, 7 tab, 5 ref.

Descriptors: *Cooling towers, *Powerplants, *Water consumption, *Arizona, Evaporation, Heat balance, Power, Water rights, Weather data, Condensers, Thermal electric powerplant, *Thermal pollution, Water pollution control.
Identifiers: *Navajo powerplant (Ariz), Lake Powell, Heat dissipation, Make-up water.

As suitable sites for very large steam-electric generating plants along natural waterways become more scarce, the use of cooling towers for purposes of cooling plant waste heat will increase. Water quantities available for withdrawal and consumption will also become limited, especially as electric production increases and the number of plants and their sizes increase. As the Navajo plant site near Page, Arizona, the water source is

Lake Powell, which is more than adequate for the proposed generating station. However, there is a limitation on the amount of water that can be withdrawn for the Navajo plant; this limitation is determined by the water rights that can be obtained. This paper analyzes these problems, presents an analytical heat-and-mass balance method for accurately determining the evaporative losses for cooling towers, reviews the influential effects of plant site atmospheric conditions on cooling tower evaporative losses, and presents other factors affecting water consumption, such as type of plant (nuclear or fossil), unit size, steam conditions, and plant loading characteristics. (Oleszkiewicz-Vanderbilt)
W72-14413

EFFECTS OF POLLUTION CONTROL ON THE FIRM,
RAND Corp., Santa Monica, Calif.
D. P. Tihansky.
Available from the National Technical Information Service as AD-737 681, $3.00 in paper copy, $0.95 in microfiche. October 1971. 13 p, 2 tab, 15 ref.

Descriptors: *Pollutants, *Pollution abatement, *Regulation, *Economic impact, Industrial wastes, Waste treatment, Costs, Benefits, Profit, Cost-benefit analysis.

The imposition of legal constraints on waste emissions has forced American industries to more than double their outlays for air and water quality control over the past five years. Future prospects of more stringent regulations imply that a doubling of present expenditures within the next five years is not improbable. The impact of environmental quality regulations on the financial position of a firm is a function of treatment costs, in-plant benefits, and external economies. While treatment costs may reduce profits, generally the cost of waste abatement and disposal is low relative to other production costs. Water treatment expenses, for example, commonly run about 2.5 percent of total capital investment. Furthermore, the treatment cost impact is mitigated by the benefits accruing to the firm. These benefits include cleaner working conditions, higher labor efficiency and productivity, fewer losses of income from absenteeism, reduced maintenance of buildings and yards, better visibility in the vicinity of the plant, and improved public and employee relations. Once these benefits are included in the cost-benefit calculus, the impact of pollution control regulations may not be as adverse as is commonly believed. (Settle-Wisconsin)
W72-14420

PHOSPHATES, HEAVY METALS, AND DDT: POLLUTION CONTROL COSTS AND IMPLICATIONS,
J. F. Brown, Jr.
In: Man's Impact on Terrestrial and Oceanic Ecosystems. MIT Press, Cambridge, Massachusetts. 1971. Chapter 32, p 489-498. 6 ref.

Descriptors: *Phosphates, *Heavy metals, *DDT, *Pollution abatement, Pollutants, Environmental effects, Eutrophication, Costs, Water pollution control.

Phosphate discharges into waterways have resulted in serious eutrophication of many lakes and rivers. The techniques available for controlling this problem include (1) reducing agricultural phosphate emissions through better agricultural management practices, (2) applying phosphate-removal technology to industrial discharges, (3) reducing or eliminating the phosphates in detergents, and (4) removing phosphate from sewage. The major cost of implementing these policies would be in the price of detergents. The heavy metals that pose problems for the aquatic environment include mercury, lead, nickel, cadmium, manganese, chromium, copper, and zinc. The technology for removing these metals is readily available. However, it must be applied as close to the point of origin as possible because of the dilutions involved. DDT presents a problem because it has translocated to lakes and oceans, accumulated in the biological food chain, and reduced the populations of many species of plankton, crustaceans, mollusks, fish, and birds. The strategies available for reducing DDT pollution include (1) minimizing its use, (2) improving application equipment, (3) improving the formulation, (4) using a nonpersistent substitute, (5) using nonchemical methods of pest control, and (6) eradicating the pest. (Settle-Wisconsin)
W72-14424

EFFECTIVE POLLUTION CONTROL IN INDUSTRIALIZED COUNTRIES: INTERNATIONAL ECONOMIC DISINCENTIVES, POLICY RESPONSES, AND THE GATT,
Colorado Univ., Boulder.
F. L. Kirgis, Jr.
Michigan Law Review, Vol 70, No 5, p 859-918, April, 1972. 4 fig.

Descriptors: *Pollution abatement, *Taxes, *Legal aspects, Environmental effects, Economic efficiency.
Identifiers: *International trade, *Consumption tax, *Economic disincentives, Production tax, Policies.

Effective pollution control will probably increase prices. In the absence of comparable pollution control by most or all of a nation's trading partners, these price increases are likely to result in reduced domestic output, a decrease in employment in the affected industries, and a worsening of the balance of payments position. Analysis of the substantive rules of the General Agreement on Tariffs and Trade (GATT) indicates that the consumption tax is the one permissible pollution-control device, despite the fact that the tax directly affects trade. However, uncoordinated consumption measures among polluting countries could amount to formidable nontariff trade barriers. Consequently, the economic argument for effective multinational coordination of pollution control efforts in the developed countries is stronger than has been generally realized. In the absence of effective coordination, GATT provides some rules and procedures that can be used to try to find a balance among liberal trade policies, national full-employment objectives, and pollution-control imperatives. Without multinational cooperation, however, the GATT provisions seem unlikely to deter environmentally-concerned countries from adapting new trade measures. Such measures could, in turn, lead to a new era of protectionism and economic instability. (Settle-Wisconsin)
W72-14426

WATER RESOURCES PLANNING STUDIES OKLAHOMA AND ARKANSAS, PHASE II (QUALITY),
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
D. F. Kincannon, W. Kao, and E. L. Stover.
Available from the National Technical Information Service as PB-212 276, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute Technical Completion Report, August 1971, 148 p, 24 fig, 5 tab. OWRR B-006-OKLA (6).

Descriptors: *Water quality, *Management, *Regional analysis, *River basin development, *Mathematical models, Design flow, Computer programs, Biochemical oxygen demand, Optimization, Organic loading, Linear programming, Oklahoma, Arkansas, Forecasting, Decision making.
Identifiers: *Arkansas River, Johnson SB distribution function, Low flow forecasting, *Zone treatment, Streeter-Phelps equation.

A mathematical model for decision making in water quality management of the Arkansas River was developed. The model centered around a zoned-optimization model which required a uniform treatment level for groups of waste waters only within grouped zones and which minimized the overall treatment. Results from low flow studies showed that the Johnson SB distribution function yielded better information for the purpose of making design flow selections. In extending the application of the zone treatment principle for regional water quality management, the feasibility of three zoning criteria were investigated. These three criteria were sub-basin, weight of influent BOD and BOD-flow ratio. A regional water quality management model involving the interrelationship of organic waste discharged, the stream assimilative capacity and the dissolved oxygen in the stream was formulated into a linear structure with an application of the Streeter-Phelps equation. The total BOD removal within the basin in pounds per day, was selected as the optimization objective. It was shown that the 'sub-basin', and 'BOD-flow ratio' were two good zoning criteria. (Galwardi-Texas)
W72-14432

URBANIZATION, WATER POLLUTION, AND PUBLIC POLICY,
Barnard Coll., New York.
G. W. Carey, L. Zobler, M. K. Greenberg, and R. M. Hordon.
Available from the National Technical Information Service as PB-212 253, $6.75 in paper copy, $0.95 in microfiche. Center for Urban Policy Research, Rutgers University, New Brunswick, N.J., 1972. 214 p, 36 fig, 50 tab, 119 ref, 4 append. OWRR C-1629 (No 3147) (1).

Descriptors: *Monitoring, *Data collections, *Cities, *Management, *Regional analysis, Urbanization, Water policy, *Simulation analysis, *Model studies, Data storage and retrieval, *Water quality standards, Treatment facilities, New York.
Identifiers: *New York-New Jersey Metropolitan Region, *Long Island, New York Harbor, *Industrial coefficients of waste water, Small area population projections, *Water surveillance, *Metropolitan water resources management.

The water surveillance network of supply and waste disposal systems of the New York Metropolitan Region was examined in detail. The structure, operation, data storage and exchange were found to be inadequate for the integrated management of the region's water resources. The viability of the urban water regime is totally dependent on chlorination technology, but the monitoring system plays a negligible role. Recommendations were made for the improvement of the surveillance net. From the best data subsets a pollution simulation model was developed and tested, using several parameters of urbanization as independent variables, population growth, percent impermeable surface, industrial waste coefficients. The results of the simulation of future behavior indicate that the policy of favoring large regional sewage plants is questionable and that there may be an ecologic ceiling to further development if water quality is to be maintained. (See also W69-06201)
W72-14437

PROCEEDINGS OF CONFERENCE ON INLAND LAKE RENEWAL AND SHORELAND MANAGEMENT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
G. Hollenstein, S. M. Born, T. Wirth, E. Bruck, and J. O. Peterson.
Available from the National Technical Information Service as PB-212 278, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, Bulletin 53, June 1972. 35 p. OWRR A-999-MINN (25).

Descriptors: *Lakes, *Management, *Shores, Wisconsin, Minnesota, Eutrophication, Agencies, Ordinances, Water quality, Ecosystems, Nutrients, Dittoral zone, Dredging, Urban runoff, Legislation, Water pollution control.
Identifiers: *Lake renewal, *Shoreland management, *Lake demonstration project, Lake improvement associations, Weed harvesting, Winter kill, Lakeshore properties.

The program of the Conference included an introduction and overview of the program of the Inland Lake Demonstration and Shoreland Management Project of Wisconsin. Reports were presented on selected lake renewal activities, selected shoreland management and development activities and shoreland management educational programs. Projects were described involving chemical inactivation of nutrients, nutrient exclusion/dilutional pumping, rehabilitation of a small flowage, urban runoff, characterization private controls for recreational land development, shoreland development, and lake rehabilitation legislation and programs. The progress of Minnesota's shoreland program and activities in lake demonstration projects was described. Alum was used successfully for chemical inactivation of nutrient in an overfertilized small lake in Wisconsin. Dilutional pumping resulted in some success in reducing the phosphorus content of another lake. Plastic sheeting, in combination with sand and gravel blankets on the bed of a millpond, was used to control aquatic plants. With regard to water-oriented recreational developments, it was suggested that an automatic property owners association can provide a mechanism for maintaining and managing the common open space and facilities to which individual lake lot owners have common rights. A nation-wide survey disclosed that explicit statutes saying that a local unit of government or State agency is authorized to project, manage, or rehabilitate lakes are rare. (Walton-Minnesota)
W72-14439

DAILY AND SEASONAL DRIFT OF ORGANISMS IN A WARMWATER STREAM,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02I.
W72-14440

GROUND WATER INFILTRATION AND INTERNAL SEALING OF SANITARY SEWERS.
Montgomery County Sanitary Dept., Dayton, Ohio.

Copy available from GPO Sup Doc EP2.10.11020DHQ06/72, $0.75; microfiche from NTIS as PB-212 267, $0.95. Environmental Protection Agency Water Pollution Control Research Series, June 1972. 71 p, 19 fig, 1 tab. EPA Program No. 11020DHQ 06/72.

Descriptors: *Water pollution control, *Sewers, *Sewerage, *Joints (Connections), *Leakage, *Infiltration, Inflow, Seepage, Infiltration rates, Pipe flow, Storm water, Storm runoff, Groundwater movement, Ohio, Peak discharge, On-site investigations, Inspection.
Identifiers: *Montgomery County (Ohio), Sealing sanitary sewers, Illicit sewer connections, Televised sewer inspection.

A program for pollution abatement was undertaken by the Montgomery County Sanitary Engineering Department in Southwest Ohio to study the effects of infiltration reduction by joint sealing and to study closed circuit television techniques. Water pollution from municipal wastewater treatment plants would be reduced if peak flows from rainfall could be reduced. This study evaluates the effects of remedial repairs to joints by use of pressure grouting of small main line sewers. A minimal measurable amount of quantity flow reduction was attributed to the sewer sealing program. Infiltration from extraneous storm water, illegal connections, and basement underdrains seem to outweigh the contribution due to leaky joints to such a degree that reduction due to joint sealing was obscured. The study does show the significance of internal television system as an inspection and maintenance tool. This information on costs, operation, and procedure is of value to anyone interested in this field. (Poertner)
W72-14441

THE TEXAS WATER QUALITY ACT.
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 06E.
W72-14443

INDUSTRIAL WASTEWATER DISCHARGES.
New York State Dept. of Health, Albany. Div. of Pure Water.
For primary bibliographic entry see Field 05A.
W72-14444

METHOD AND APPARATUS FOR CONTAINING WELL POLLUTANTS,
C. G. Riester.
U. S. Patent No. 3,561,220, 2 p, 6 fig; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 507, February 9, 1971.

Descriptors: *Patents, Oil spills, *Oil wastes, *Oil wells, *Pollution abatement, Separation techniques, Equipment, Water pollution control, Oil pollution, Water pollution treatment.

Offshore well pollutants are contained by an annular submerged caisson which is placed to surround an offshore well point. The caisson has an annular axially expansible water impermeable member secured at its lower end to the top of the caisson and extending to the waterline to form a liquid barrier around the well point. If oil or other contaminants spill into the water they can be pumped or clam-shelled into a barge or other vessel alongside the caisson. (Sinha-OEIS)
W72-14451

OIL SLICK DISPERSION APPARATUS,
W. H. McNeely.
U. S. Patent No. 3,561,601, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 604, February 9, 1971.

Descriptors: *Patents, *Dispersion, *Oil pollution, *Oil spills, Oil wastes, Water pollution control, Water pollution treatment, Pollution abatement, Equipment.
Identifiers: *Chemical disperants.

A boat is driven in a predetermined path through the oil slick, the bow wave of the boat separating and concentrating the oil along the sides of the boat. A chemical dispersant, mixed in a controlled ratio with water, is ejected under high pressure from nozzles mounted near the bow. The nozzle action sweeps the dispersant across the oil in a side path on both sides of the boat. At each pass of the boat a wide swath is cut through the oil. This permits rapid dispersion of an oil slick over a large area with minimum contamination of the water. (Sinha-OEIS)
W72-14453

AERATION APPARATUS,
Owens-Illinois, Inc., Toledo, Ohio. (Assignee).
S. F. Galeano.

Descriptors: *Patents, *Aeration, Equipment, Water treatment, *Pollution abatement, Water pollution control, Water pollution treatment.

The floating self-propelled water aerating unit contains a power driven rotor mounted so that it rotates about a horizontal axis. Particles of water are forced out of and away from the water surface. A flat baffle plate is mounted at 45 degrees with the surface of the water and extends above and below the water as it intercepts the water particles in motion. As the turbulence is created large quantities of air are transferred into the water. (Sinha-OEIS)
W72-14454

INFLATABLE FLOATING BOOMS,
M. F. Smith, and R. M. Blair.
U. S. Patent No. 3,563,036, 4 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 3, p. 946, February 16, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Oil wastes, *Skimming, *Flotsam, *Pollution abatement, Water pollution control, Water pollution treatment, Equipment, Separation techniques.
Identifiers: *Booms (Floating).

An elongated thin flexible fin is combined with a longitudinally spaced complex of individually inflatable buoyant floatation pockets. Automatic inflation of successive pockets occurs upon unfolding deployment of the booms. Compressed gas charge cylinders are triggered by the unfolding process and provide the inflation pressure. The equipment in deflated condition may be air dropped at the required oil spill site. (Sinha-OEIS)
W72-14457

METHOD OF REMOVING FLOATING CONTAMINANTS FROM STREAMS,
F. B. Thomas.
U. S. Patent No. 3,563,380, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 3, p. 1030, February 16, 1971.

Descriptors: *Patents, *Oil pollution, Oil wastes, Oily waster, *Flotsam, *Skimming, Barriers, *Pollution abatement, Water pollution control, Water pollution treatment, Equipment, Separation techniques.

A floating barricade is positioned at an angle to a flowing stream extending across it. It collects contaminants flowing with the stream. The contaminants, oil, grease, and other floating materials are directed towards a particular section and may be removed manually or otherwise skimmed from the surface. (Sinha-OEIS)
W72-14458

PURIFICATION SYSTEM FOR ORGANICALLY CONTAIMINATED WATER,
For primary bibliographic entry see Field 05D.
W72-14460

FLEXIBLE FLOATING BOOMS,
M. F. Smith.
U. S. Patent No. 3,564,852, 3 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 883, No 4, p 1390, February 23, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Separation techniques, Water pollution control, Water pollution treatment, Pollution abatement.
Identifiers: *Booms (Floating).

A high strength steel reinforcing cable is anchored along one side of a polymer fin closely adjacent to the undersides of longitudinally separated buoyant floats. The fin lengths are greater than the corresponding cable lengths. The excess fin length facilitates flexing of the resulting boom structure in all directions. The boom conforms to the troughs and crests of steep choppy waves. It is employed to enclose and confine a body of floating oil on the surface of the water. (Sinha-OEIS)
W72-14463

OIL WATER SEPARATION SYSTEM FOR TANKERS,
Esso Research and Engineering Co., Linden, N.J. (assignee).
J. J. Sheehy, and P. A. Sait.
U. S. Patent No. 3,565,252, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1492, February 23, 1971.

Descriptors: *Patents, *Pumps, *Oil wastes, *Oily water, *Oil pollution, Equipment, Pollution abatement, Water pollution control, Water pollution treatment, Separation techniques.
Identifiers: Oil tankers, *Oil-water separation.

A high capacity pump and a low capacity pump remove water which has settled to the bottom of the tank. One pump is used for decanting, the other is deactivated by an oil/water interface sensor thereby reducing the risk of discharging contaminated water during decanting. Two oil water separators are used. The second operates on a coalescing principle whereby very fine droplets of oil remaining in the effluent will be removed so that water passing out will be below a given oil water concentration. (Sinha-OEIS)
W72-14465

FLOATING BARRIER FOR WATER POLLUTANTS,
C. Cavalieri.
U. S. Patent No. 3,565,257, 2 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1493, February 23, 1971.

Descriptors: *Patents, *Flotsam, *Oil wastes, *Barriers, *Liquid wastes, Water quality, Water pollution treatment, Water pollution control, Pollution abatement, Separation techniques, Equipment, *Absorption.

The floating barrier consists of a central rope of polypropylene fiber with a layer of polystyrene surrounding it. There is a second layer of a mixture of polypropylene granulor polystyrene. The mixture is contained within a netting of polypropylene fiber. The barrier has substantial ability to absorb polluting liquids suspended in the water, such as oil, or other fluids that have a specific gravity less than water. (Sinha-OEIS)
W72-14466

OIL LEAKAGE BARRIER,
E. E. Headrick.
U. S. Patent No. 3,567, 019, 4 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 158, March 2, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Barriers, Water pollution control, Water quality, Water pollution treatment, Pollution abatement, Separation techniques.

An elongated hollow and flexible structure consists of two chambers. The ends of the structure are secured to define a boundary of predetermined area. A buoyant distention is created in the first chamber. The structure floats with a transverse section extending below the surface and a portion extends a predetermined distance above the surface. The structure rises and falls with the ebb and flow of the waves and confines the substance such as oil. By attaching a bag or container to the exterior of the structure, the weather and wave action can be used to 'pump' the oil into a container for storage for later retrieval. (Sinha-OEIS)
W72-14470

UNDERGROUND WASTE MANAGEMENT AND ENVIRONMENTAL IMPLICATIONS - A SYMPOSIUM.
American Association of Petroleum Geologists, Inc., Midland, Tex.
American Association of Petroleum Geologists Bulletin, Vol. 55, No. 11, p 2078-2098, November 1971.

Descriptors: *Waste disposal, *Injection wells, *Radioactive waste disposal, Industrial wastes, *Underground waste disposal, Environmental engineering, *Abstracts.

A general outline is presented of a symposium on underground waste disposal held in Houston. Thirty-five speakers were assembled from private practice, universities, industry, and governmental agencies to present their findings, and abstracts of all their papers are given. (Campbell-NWWA)
W72-14480

RUBBER FIBER WELL SEAL.
For primary bibliographic entry see Field 08B.
W72-14499

BACTERIOLOGICAL AND CHEMICAL FACTORS IN INDUCED INFILTRATION,
F. H. Klaer, Jr.
Ground Water, Vol 1, No 1, p 38-43, January, 1963. 8 ref.

Descriptors: *Logging (Recording), Water wells, Drilling, *Water quality, Saline water, Aquifer characteristics, *Conductivity.
Identifiers: Temperature survey, *Sample logs, Brown water.

The lowering of ground-water levels by pumping from horizontal or vertical wells near a surface stream may cause water to move from the stream into the water-bearing materials by the process known as induced infiltration. In such cases, the natural deposits of sand and gravel serve as large natural filter beds effectively removing or reducing turbidity, organic material and pathogenic bacteria. This paper discusses the general processes by which such removal is accomplished as well as the significance of certain changes in chemical characteristics of the water as it passes from a surface source to an underground point of collection. By a better understanding of the processes involved, the bacteriological and chemical quantities of infiltrated water supplies can be improved. (Campbell-NWWA)
W72-14504

TECHNIQUES OF EVALUATING EFFECTS OF WATER ON DRAINAGE STRUCTURES IN ALABAMA,
Geological Survey of Alabama, Montgomery. Water Resources Div.
For primary bibliographic entry see Field 08G.
W72-14522

A WATER QUALITY MANAGEMENT STRATEGY FOR THE GREAT LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
R. E. Frenette.
Technical Report 34, December 1971. 221 p, 7 fig, 12 tab, 4 append, 203 ref. OWRR C-1196 (1963) (1).

Descriptors: *Great Lakes, *Water quality control, *Water pollution, *Waste treatment, *Planning, Decision making, Effluents, Eutrophication, Discharge (Water), Sewage, Sewage treatment, Waste water treatment, Industrial wastes, Municipal wastes, Thermal pollution, Domestic wastes, Harbors, Waste identification, Project planning, Project purposes, International commissions.

A strategy is presented for developing a water quality management plan for the Great Lakes. The plan would encompass a wide range of activities from preservation to restoration of water quality. The strategy is developed through a traditional planning framework including problem identification and description, value and goal development, alternative identification and evaluation, and ultimate choice. Five classes of discharge that must be controlled are standard metropolitan statistical area discharges; water-using industries; combined-sewers; ports, harbors and marinas; and electric power generating plants. The efforts which the United States government should take are emphasized, however, the Canadian viewpoint is considered. The strategy is designed to meet the water pollution reduction goals of the Great Lakes while permitting the satisfaction of human wants and needs. Complete freedom from institutional constraints should be maintained in order to design optimal water quality control plans that apply the full range of science and technology, economies of scale, and management. (Grant-Florida)
W72-14544

PRIVATE COMPENSATION FOR INJURIES SUSTAINED BY THE DISCHARGE OF OIL FROM VESSELS ON THE NAVIGABLE WATERS OF THE UNITED STATES,
Miami Univ., Fla. Sea Grant Institutional Program.
T. R. Post.
Available from the National Technical Information Service as COM-72-10364, $4.85 in paper copy, $0.95 in microfiche. Sea Grant Technical Bulletin, No 22, January 1972. 79 p, 1 tab, 206 ref.

Descriptors: *Oil pollution, *Oil spills, *Compensation, *Legal review, Judicial decisions, Water law, Legal aspects, Watercourses (Legal aspects), United States, Water pollution sources, Oil wastes, Federal government, State governments, Oil industry, Ships, Oceans, Legislation, Constitutional law, Water pollution effects, Negligence, Navigable waters, Federal jurisdiction, Law enforcement.
Identifiers: *Coastal waters, Sovereign immunity, Absolute liability.

This study examines the methods by which private persons may seek compensation for damage they sustain from the discharge of oil from vessels on the navigable waters of the United States. The sources and consequences of such discharges are discussed. Fault, strict liability, and absolute liability are noted as different standards of liability. Procedural aspects are covered, including jurisdiction, choice of a forum and sovereign immunity. The availability of compensation is discussed based on tort liability; federal anti-pollution statutes, including the Water Quality Improvement Act and the Refuse Act; state anti-pollution statutes; and international conventions. Several proposals to enhance the availability of compensation to persons injured by oil discharges are discussed. Additional state statutes offer little hope because of constitutional restrictions. A judicial declaration that transporting oil at sea in bulk is an ultrahazardous activity is one alternative. Another alternative is the establishment of a federal relief fund to compensate parties injured by an oil discharge. (Brackins-Florida)
W72-14545

SCL SPONSORED 'EXCURSION' INTO FORESTRY, ECOLOGY, AND NATURAL RESOURCES IN SOUTH CAROLINA,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14547

JETPORT: PLANNING AND POLITICS IN THE BIG CYPRESS SWAMP,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 06G.
W72-14548

OIL POLLUTION PROBLEMS ARISING OUT OF EXPLOITATION OF THE CONTINENTAL SHELF: THE SANTA BARBARA DISASTER,
D. J. Walmsley.
San Diego Law Review, Vol 9, No 3, p 514-568, 1972. 253 ref.

Descriptors: *California, *Oil spills, *Well regulations, *Legal aspects, Judicial decisions, Law of the sea, Common law, Constitutional law, Legal review, Continental shelf, Environmental effects, Water pollution, Water pollution sources, Social aspects, Damages, Economic impact, Oceans, Pacific Ocean, Federal jurisdiction, State jurisdiction.

The 1969 Santa Barbara channel oil well 'blow-out' is a good illustration of the inadequacy of both governmental control of off-shore drilling and the legal system's conflict resolution capacity. Three lawsuits that grew out of the blow-out and the alternative theories of liability are analyzed. A suit by the state of California against the United States was grounded in negligence under the Tort Claims Act. In the suit by California against Union Oil a state jurisdictional problem arose since the drilling occurred on the continental shelf. Five separate theories of liability were advanced in the case including strict liability for escaping substances and violation of state law. The final case was a private class action against Union Oil based on strict liability and negligence. A separate discussion is presented on the question of damages. Modern statutory pollution law, case law, and international conventions relating to pollution control are outlined. The blow-out demonstrates the need for a legal mechanism for internalizing the external economic and social costs of off-shore oil drilling. (Grant-Florida)
W72-14550

EXEMPTIONS FROM NEPA REQUIREMENTS SOUGHT FOR NUCLEAR PLANTS, POLLUTION PERMITS,
For primary bibliographic entry see Field 06E.
W72-14551

WATER POLLUTION--PENALTY.
For primary bibliographic entry see Field 06E.
W72-14554

EVERGLADES-BIG CYPRESS NATIONAL RECREATION AREA.
For primary bibliographic entry see Field 06B.
W72-14556

INTERNATIONAL COOPERATION IN THE HUMAN ENVIRONMENT THROUGH THE UNITED NATIONS.
For primary bibliographic entry see Field 06E.
W72-14557

PUGET SOUND AND ADJACENT WATERS COMPREHENSIVE PLAN (DRAFT ENVIRONMENTAL STATEMENT).
Pacific Northwest River Basins Commission, Vancouver, Wash.
For primary bibliographic entry see Field 06G.
W72-14558

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14561

WATER TREATMENT FACILITIES, FOSS RESERVOIR, CUSTER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Fort Worth, Tex. Region VI.
For primary bibliographic entry see Field 05F.
W72-14563

TRAINING DIKE AND BREAKWATER, EVERETT HARBOR, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-14566

ALTERNATE DISPOSAL METHOD FOR DETROIT AND ROUGE RIVERS, WAYNE COUNTY, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.

Available from the National Technical Information Service as PB-206 559D. $3.00 in paper copy, $0.95 in microfiche. January 10, 1972. 25 p, 3 plate, 2 tab, 4 ref.

Descriptors: *Spoil banks, *Michigan, *Environmental effects, *Waste disposal, *Facilities, Dikes, Disposal, Environmental engineering, Administrative decisions, Water pollution, Dredging, Sediment control, Channel improvement, Project planning, Alternate planning, Lake Erie, Lake Huron.
Identifiers: *Environmental Impact Statements, *Detroit River (Mich), Rouge River (Mich).

The project involves construction of a contained disposal facility at Pointe Mouillee, Wayne County, Michigan, for polluted dredge spoil from the lower Detroit and Rouge Rivers. It is estimated that a combined annual total of 165,000 cubic yards of dredge spoil will be dumped. The facility includes an access channel, turning basin, mooring area, and pumpout station and will accommodate disposal for the two rivers for 10 years. Containment of the polluted dredge spoil will eliminate open lake dumping and remove a source of pollution from the open waters. Ultimate development of the site will provide a recreational facility for the people of southeastern Michigan. Adverse environmental effects include converting the area from open water and marsh land to dry land by filling the proposed 508 acre site, prohibiting boating in the area, and the noise from the operation. Additionally surface waters within the enclosure may become stagnant. There is danger of possible spills in transporting dredged materials, and the project will involve a loss of 365 acres of waterfowl habitat. Alternatives include resuming open lake dumping, discontinuing dredging, and alternative disposal sites. (Widman-Florida)
W72-14568

LINCOLN LAKE, EMBARRAS RIVER, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.
W72-14569

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14571

SCITUATE HARBOR, SCITUATE, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14572

DUCK RIVER PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Science.
For primary bibliographic entry see Field 08A.
W72-14575

CATTLE FEEDERS MUST COMPLY WITH ANTI-POLLUTION LAWS,
For primary bibliographic entry see Field 06E.
W72-14579

THE USE OF WASTE HEAT IN AGRICULTURE,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 03F.
W72-14584

A CURRENT PROBLEM IN THE ENVIRONMENTAL CRISIS, MERCURY POLLUTION, AND ITS LEGAL IMPLICATIONS,
Washington Univ., St. Louis, Mo. Center for Biology of Natural Systems.
For primary bibliographic entry see Field 06G.
W72-14631

RELATIONSHIPS BETWEEN SUPPLIES AND PROJECTED DEMANDS FOR WATER IN A SIX-COUNTY URBANIZING REGION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06D.
W72-14639

A WATER QUALITY MODEL FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05B.
W72-14641

DISPERSION OF POLLUTANTS IN THE COASTAL WATERS OF THE SOUTHEASTERN UNITED STATES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05B.
W72-14651

MARSELLE-FOS: THE EQUIPMENT FOR A SEA SHORE; THE STABILITY TO PRESERVE, (MARSEILLE-FOS: L'EQUIPMENT D'UNE FACADE MARITIME; LES EQUILIBRES A PRE-SERVER),
Port Autonome de Marseille (France).
M. Pechere.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I, 3 p.

Descriptors: *Coasts, *Littoral, *Planning, *Area redevelopment, Industries, Urbanization, Tourism, Parks, Recreation facilities, Conservation, *Pollution abatement, Water pollution control.
Identifiers: *Port Marseille-Fos (France).

The littoral zone of the Port Marseille-Fos area is discussed. Prevention of damage to the shore is being considered as a part of the development plans for the area. In spite of the area becoming an important industrial site, plans are being laid for urbanization and tourism with natural parks and lakes in the hopes that such a design will aid in the prevention of pollution. (Ensign-PAI)
W72-14652

THE METHOD OF SEDIMENTATION OF HYDROCARBONS USED AT THE TIME OF THE 'TORREY CANYON' DISASTER: THE

NAUTEX HYDROPHOBE, (LA METHODE DE SEDIMENTATION,
Societe OMYA (France).
B. Vandon.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome II, 10 p, 6 fig.

Descriptors: *Oil spills, *Organic compounds, Water pollution effects, Sedimentation, *Physiocochemical properties, Hydrobiology, Ecology, Environmental effects, Water pollution control.
Identifiers: *Sedimentation method, Nautex Hydrophobe, 'Torrey Canyon'.

The sedimentation method used to remove oil spilled by the 'Torrey Canyon' is described with consideration of the possibilities of applying it to other areas. The physico-chemical and hydrobiological characteristics necessary for sedimentation agents used in the Nautex Hydrophope method are discussed. The effects on the ecology of the marine environment from the hydrocarbons spilled and from the use of the Nautex Hydrophobe removal method are considered. (Ensign-PAI)
W72-14653

VITAL CONDITIONS FOR THE ORGANIZATION OF A THALASSOTHERAPIE CENTER TO FACILITATE INDUSTRIAL MANAGEMENT OF THE LITTORAL, (CONDITIONS INDISPENSABLES POUR L'ORGANISATION D'UN CENTRE DE THALASSOTHERAPIE EN FONCTION DE L'AMENAGEMENT INDUSTRIEL DU LITTORAL),
Federation Internationale de Thalassotherapie.
For primary bibliographic entry see Field 05C.
W72-14654

THE ELIMINATION OF THE HYDROCARBONS IN THE SEA, (ELIMINATION DES HYDROCARBURES EN MER),
Centre National de'Etudes pour la Protection des Aliments, Materiaux et Etres Vivants.
P. Fusey.
In: Colloque International Sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome II, p 1-3.

Descriptors: *Oil pollution, Oily water, *Organic compounds, Cleaning, *Emulsions, *Surfactants, *Biodegradation, Environmental effects, Harbors, Beaches, Water pollution treatment, Water pollution control.
Identifiers: 'Le Sefoil', Molasses, Phosphomic acid, Terreous alcalino phosphate.

The removal of oil from the sea by Le Sefoil, a mixture of molasses, phosphoric acid and terreous alcalino phosphate is described. Le Sefoil, easily tolerated by marine organisms in concentrations of 120-300 ppm, combines with oil forming a stable emulsion that is biodegradable. It has no long term effects and is very efficient for use on beaches, cliffs and in harbors but is difficult to apply in the open ocean. A similar product in powder form is also discussed. (Ensign-PAI)
W72-14655

CURRENT VELOCITIES IN THE VICINITY OF THE GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT'S IONA ISLAND OUTFALL - 1968,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 05B.
W72-14657

THE SHELL 'OIL-SINKER METHOD',
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
M. M. Tadema, and Jongbloet.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I, 15 p, 16 fig.

Descriptors: *Oil wastes, *Oil pollution, *Oil spills, *Wetting, *Sands, *Surfactants, Water pollution control, Disasters.
Identifiers: *Oil Sinker Method, North Sea.

An oil sinking method that uses a wetting agent combined with sand dredged from the sea is presented. The Shell 'Oil-Sinker' Method was tested on Kuwait crude oil spilled in the North Sea. Approximately 95% of the oil sank immediately behind the dredger and came to rest over a 50 m stretch of the sea bed in waters about 25 m deep. Some oil reappeared on the surface but was very light and shifted with the wind. Fish catch and nets showed signs of oil contact, however, after rinsing the fish lost the odor and taste of oil. Birds seemed totally unaffected. The oil/sand mixture on the bottom was in the form of a fluffy loose layer which in a short time was completely mixed and covered with sand. At no time was the jettisoned oil found on the beaches. The method is recommended for disastrous cases of oil pollution but not for small-scale spills. (Ensign-PAI)
W72-14660

RISKS OF RADIOACTIVE POLLUTION OF THE OCEANS,
California Univ. Medical Center, San Francisco. Radioactivity Research Center.
Jerold M. Lowenstein.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I. 6 p.

Descriptors: *Water quality standards, *Radioactive wastes, *Nuclear explosions, Testing, *Fallout, *Nuclear powerplants, Ships, Radioactivity effects, Ecology, Public health, Safety factors, Regulation, Water pollution control.

Though radioactive pollution has been decreasing for the past 10 years, due to the cesation of atmospheric atomic weapon testing by the U.S. and U.S.S.R., the trend is about to be reversed as other nations resume nuclear weapon testing and as the numbers of nuclear plants and nuclear ships increase. The controversy as to the 'safe' concentration levels of these materials is debated. Standards and controls are discussed and the effects on ocean ecology and human health when these standards are not high and controls not rigorously enforced are assessed. (Ensign-PAI)
W72-14661

INDUSTRIAL FEASIBILITY OF MANMADE ISLANDS CONSTRUCTED FROM THE OFFSHORE DISPOSAL OF DREDGED SPOIL,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 05C.
W72-14662

WATER POLLUTION BY SEWAGE FROM WATER CRAFT,
Washington, Univ., Seattle. Coll. of Engineering.
For primary bibliographic entry see Field 05B.
W72-14663

DISCOLORATION OF ALGAL BLOOMS AND SEAWEEDS (VEGETATIONSFARBUNGEN UND WASSERBLUTEN),
Oesterreichische Gesellschaft fuer Meteorologie, Vienna (Austria).
For primary bibliographic entry see Field 05C.
W72-14673

WATER QUALITY VERSUS RESIDENTIAL DEVELOPMENT: POLITICAL AND ADMINISTRATIVE ASPECTS OF WATER QUALITY MAINTENANCE IN PERRY AND CLINTON RESERVOIRS,
Kansas Water Resources Research Inst., Manhattan.
S. M. Wyman.
Available from the National Technical Information Service as PB-212 269, $3.00 in paper copy, $0.95 in microfiche. Contribution No 107, July 1972. 108 p, 14 tab, 2 append. OWRR Project A-037-KAN (1).

Descriptors: *Reservoirs, *Attitudes, Water quality control, *Decision-making, *Kansas, Water demand.
Identifiers: *Residential development, Public policy, *Perry Reservoir, *Clinton Reservoir.

Given their proximity to major population centers in Kansas, reservoirs in the eastern portion of the state are attracting considerable residential development. This development has the potential to devalue the factors that lead to its creation. This includes the possibility of a decline in water quality. There are many decisions that will be made concerning the maintenance of water quality in these areas. A large proportion of these decisions will be made in the public sector, and others, while private in nature, will have important ramifications for a diversified public. The most important decisions will be made at the local level by county and special district officials, developers, and buyers. The federal and state governments will play secondary roles. While individuals buying property in the areas studied expressed a concern with water quality maintenance, there are little evidence to suggest this would be converted into policy or even serve as demand inputs into the policy formation process. Dissatisfaction with water quality will more likely lead to an exodus than to political activity. This is facilitated by the number of reservoirs in the state and the continuing construction activity of the Corps of Engineers. Therefore, a development ethos such as expressed by many developers and local officials is likely to be self-defeating if adequate provisions are not made early in the development process for water quality maintenance.
W72-14675

MODELING AND OPTIMIZATION OF THERMAL POLLUTION CONTROL SYSTEMS,
Kansas Water Resources Research Inst., Manhattan.
C. L. Hwang.
Available from the National Technical Information Service as PB-212 270, $3.00 in paper copy, $0.95 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No 103. 35 p, 7 fig, 4 tab, 23 ref, append. OWRR A-038-KAN (1).

Descriptors: *Thermal pollution, *Water quality control, *Optimization, *Model studies, *Control systems, Powerplants, Dynamic programming, Water quality standards, Water temperature, Biochemical oxygen demand, Dissolved oxygen.
Identifiers: *Water quality models, *Feedback control, Optimal control.

The literature on dynamic mathematical models of water quality in streams and the temperature effect on DO and BOD concentrations is reviewed. A method of optimal control is applied to the determination of an optimal cooling water discharge policy of a power plant. Such a policy permits a plant to operate at the highest possible efficiency without violating a preassigned stream quality criterion. The spatial distribution of temperature and its temporal change and their effects on the BOD and DO distributions in a stream are simultaneously determined. The development of optimal feedback control theory through the continuous dynamic programming and continuous maximum principle is reviewed. The development initially deals with linear systems and is then ex-

tended to nonlinear systems and distributed parameter systems. The management of a complex water quality control system is studied. The related water quality standards are (1) the maximum allowable stream temperature, (2) the allowable rise in stream temperature, and (3) DO concentration. The determination of minimum - cost control policies for a basin (a multi-stage system) which receives the thermal waste from power plants and the organic waste of BOD discharges is investigated by applying the generalized reduced gradient method.
W72-14676

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH, REPORT ON MONOHYDRIC PHENOLS AND INLAND FISHERIES.
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
For primary bibliographic entry see Field 05C.
W72-14698

IMPACTS OF OIL ON THE GULF COAST,
Louisiana Wild Life and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 05C.
W72-14702

THE VORTEX PRINCIPLE: A METHOD FOR CONCENTRATING MATERIALS FROM A LIQUID PHASE,
Naval Research Lab., Washington, D.C.
A. Stamulis.
Available from NTIS, Springfield, Va. 22151, as AD-738 802, Price $3.00 Paper copy; $0.95 microfiche. Memorandum Report 2401, February 1972. 22 p, 3 fig, 11 ref.

Descriptors: Water pollution treatment, *Oil spills, *Laboratory tests, *Analytical techniques, *Vortices, Rotational flow, Model studies, Surface waters, Oceans, Lakes, *Separation techniques.
Identifiers: *Vortexing, *Oil spill recovery.

A material less dense than water can be concentrated in a central pocket to form a vortex if the material is immiscible and unreactive with water. The vortexing technique was used in laboratory-scale experiments involving several liquids and solids in water to determine if this technique can be extended to concentrating oil spills in oceans, seas, and lakes. Simulation of complete open-water testing was hampered by the presence of a wall effect in the containers used for the laboratory experiments. Initial parameters such as speed, impeller type, impeller size, shaft diameter, shaft length, tank size and shape, are interrelated and must be determined for each individual water-oil combination. Substances like oil can be recovered by vortexing with a minimum of emulsification and can easily be separated from water. Oil films of varying thicknesses can be successfully vortexed with or without the use of a wetting agent. (Woodard-USGS)
W72-14734

POLLUTION CONTROL IN INDIANA,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14754

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATER ALONG THE LOUISIANA COAST (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, New Orleans, La.
Available from the National Technical Information Service as PB-208 188-D, $3.00 in paper copy, $0.95 in microfiche. February 1972. 81 p, 2 map, 29 ref.

Descriptors: *Environmental effects, *Gulf of Mexico, *Louisiana, *Resources development, Data collections, Permits, Oil pollution, Oil spills, Gases, Navigable waters, Bays, Salts, Sulfur, Sands, Clays, Drilling, Disposal, Turbidity, Water pollution sources, Benefits, Costs, Feasibility, Oil wells, Dredging.
Identifiers: *Environmental Impact Statements, Coastal waters.

The report contains the available data and criteria to be considered in determining the environmental impact involved in the issuance or denial of permits to explore for oil or gas or develop production of such resources or other mineral resources in navigable waters along the Louisiana coast, including state-owned water bottoms in the Gulf of Mexico and bays, lakes and sounds directly connected thereto. The possible effects of the development of such resources as oil, salt, sulfur, stone, sand and gravel, and clay are evaluated. Pollution from such sources as petroleum spillage and gas leakage may stem from collision damages, common natural disasters, subsidences causable by withdrawals of gas, equipment failures and seismic disturbances. Other sources include temporary turbidity during exploration and development, dredging, disposal of drill and mud cuttings, and altered salinity and circulation of marsh areas. Proposed action includes the continued issuance of permits subject to applicable regulations; the denial of drilling permits for drilling in such areas as navigation channels and fairways; and issuance of permits on an individually evaluated basis for inshore areas having water cover depth less than six feet. (Ellis-Florida)
W72-14756

JACKSONVILLE HARBOR, FLORIDA (SECTION I). NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W72-14760

MANITOWOC HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 04A.
W72-14761

MAINTENANCE OF THE WESTCHESTER CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-14762

TESORO TANK FARM AND BARGE SLIP, JUNEAU, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-14763

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 08D.
W72-14772

DOCUMENTS FOR THE U.N. CONFERENCE ON THE HUMAN ENVIRONMENT, STOCKHOLM, JUNE 5-16, 1972--PART III.
Department of State, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14773

STOCKHOLM CONFERENCE ON THE HUMAN ENVIRONMENT,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14774

DEPT. OF PUBLIC HEALTH V. CUMBERLAND CATTLE CO. (POLLUTION OF WATER SOURCE BY DAIRY FARM OPERATIONS).
For primary bibliographic entry see Field 06E.
W72-14776

THE ENVIRONMENTALIST AND RADIOACTIVE WASTE,
Lake Forest Coll., Ill. Industrial Management Inst.
J. B. Moore.
Chicago-Kent Law Review, Vol. 49, p 55-80, 1972. 140 ref.

Descriptors: *Radioactive wastes, *Environmental effects, *Radioactivity, *Water quality control, Aquifers, Judicial decisions, Administrative agencies, Radioactive waste disposal, Regulation, Standards, Radioactivity effects, Federal government, Disposal, Public health, Legal aspects, Legal review, Water pollution sources, Nuclear wastes, Administrative decisions.
Identifiers: Atomic Energy Commission.

The hazards created by the use of atomic energy, primarily in the creation of electric power, are put into some perspective. Consideration is given to radioactive pollution and its effects. The production and disposal of radioactive wastes, including disposal into lakes and rivers are discussed. In this regard the possible radioactive pollution of aquifers by these disposal methods is considered. The Atomic Energy Commission (AEC) is responsible for managing the military use of atomic energy, developing and expanding peaceful uses, and assuring public health and safety from the dangers of atomic radiation. The task of environmentalists in influencing the AEC is very difficult. Four key decisions involving the AEC are discussed, including (1) the first contested licensing procedure; (2) the first challenge to radiation standards; (3) the first federal case to dispute the AEC's right to preempt the setting of radiation standards; and (4) the first interpretation, relative to the AEC, of the environmental control acts. A fifth case, settled out of court, demonstrates methods of forcing more rigid safety standards than those of the AEC on nuclear-power companies. Many people believe the standards of the AEC have been overly lax. Environmentalists must continue to be watchdogs over the AEC, its standards and its decisions. (Widman-Florida)
W72-14779

THE TENNESSEE WATER QUALITY CONTROL ACT OF 1971,
Florida Univ., Gainesville. Coll. of Law.
F. E. Maloney.
Vanderbilt Law Review, Vol. 25, p. 331-366, 1972. 32 ref.

Descriptors: *Water law, *Public rights, *Legislation, *Water quality control, *Tennessee, Water pollution control, Administrative agencies, Judicial decisions, State governments, Permits, State jurisdiction, Water resources planning, Long-range planning, Legal aspects, Legal review, Law enforcement, Regulation, Permits, Constitutional law.
Identifiers: *Public trust doctrine, Injunctions.

The text of the Tennessee Water Quality Control Act of 1971 and commentary upon the Act are presented. A study was undertaken at the request of the Tennessee legislature. The Act incorporates the public trust doctrine, a concept which seeks to

revitalize water law by imposing a duty both on state authorities and on private citizens to protect the rest of the trust for all citizens. The Act's definition of pollution is designed to include all harmful alterations of the properties of Tennessee's waters. The Act creates the Water Quality Control Board which exercises responsibility for the planning and coordination of a statewide pollution control program. The Commissioner of Public Health is in charge of enforcement of the Act. The permit system is used as the foundation for the regulatory provisions of the statute. Under the permit system, any alteration of water quality is prohibited except as permitted by the Commissioner under regulations promulgated by the Board. The Act establishes a means by which damages may be recovered by the state for pollution of state waters, and establishes various means for criminal and injunctive enforcement of its provisions. (Waldron-Florida)
W72-14781

THE PATHOLOGY OF LAKE ERIE,
Q. Dadisman.
The Nation, Vol. 214, p. 492-496, April 17, 1972. 1 plate.

Descriptors: *Lake Erie, *Eutrophication, *Chemical wastes, *Political aspects, Lakes, Great Lakes, Algal blooms, Aging (Biological), Lake stages, Mesotrophy, Oligotrophy, Water pollution sources, Water pollution effects, Mercury, Sewage disposal, Phosphates, Phosphorus, Chemical wastes, Limnology, International Joint Commission, Canada, Federal Government, State Governments.
Identifiers: *Mercury pollution, *Environmental Protection Agency.

Although most reports indicate that Lake Erie is 'dead', a recent study shows that the Lake in not dead and could be revived in one generation. One serious problem is the input of phosphorus into the Lake. Scientists believe that if this input were reduced a quick improvement in the condition of the Lake could be expected. Other problems include the large amounts of mercury discharged by chloralkali plants near Detroit and the discharges of sewage all along the coast. One of several factors preventing improvement of the Lake's condition is the lack of an institutional mechanism for cooperation between the United States and Canada. This can be traced to three conditions in America: inferior American technology in sewage and pollution treatment, the U.S. hesitance to eliminate the phosphate content of household detergents, and the political inability of the U.S. to act quickly. As a result, phosphates and other pollutants continue to enter Lake Erie with little hope remaining for the Lake. The U.S. bureaucracy, in particular the Environmental Protection Agency, fails to recognize that stricter pollution control standards are needed in the Great Lakes than for the ocean. (Nielsen-Florida)
W72-14782

SHOWDOWN ON DELAWARE BAY,
S. Lindsay.
Saturday Review, Vol. 55, p. 34-39, March 18, 1972. 3 photo, 1 map.

Descriptors: *Delaware, *Legislation, *Oil pollution, *Shore protection, Coasts, Coastal marshes, Wetlands, State Governments, Docks, Beaches, Estuaries, Salt marshes, Oil industry, Storage tanks, Beaches, Water pollution, Ships, Water pollution sources, State jurisdiction, Political aspects, Delaware River, Oil spills.
Identifiers: *Coastal waters.

Delaware Governor Russell W. Peterson discusses the background of the Delaware Coastal Zone Act of 1971 and analyzes some of its provisions. Delaware Bay is one of three spots in the U.S. deep enough to accommodate the new supertankers. Consequently, heavy manufacturing industries have been attracted to the area. The Delaware Coastal Zone Act bars such industries from locating in a two-mile-wide strip along the state's 115-mile coastline. It specifically bans oil refineries, petrochemical complexes, and basic steel and paper mills. It also prohibits construction of marine terminals for transshipment of liquid and solid bulk materials in the bay. Heavy water traffic in the bay area has raised fears of collisions and possible oil spills. The increased delivery of oil would attract more oil refineries. It was feared that storage of supplies of coal, iron ore and petroleum would lead to development of heavy industries in the area, introducing pollutants into the air and water. The Act is an attempt to protect coastal bays, beaches and wetlands. (Nielsen-Florida)
W72-14783

REVIEW OF THE LEGAL ASPECTS OF INTERNATIONAL WATER POLLUTION CONTROL,
S. O. Ezediaro.
Howard Law Journal, Vol. 17, p. 69-90, 1971. 101 ref.

Descriptors: *International waters, *Water pollution control, *Oil wastes, *International law, Water law, Law of the sea, International Joint Commission, Federal government, Nuclear wastes, Radioactive waste disposal, Ships, Legal review, Legal aspects, Jurisdiction, Political aspects, Social aspects, Oceans, Treaties, Legislation, Governments, Water pollution sources.

Actions carried out by international organs and national governments in the field of water pollution control are examined. Steps have been taken to control pollution of the sea, primarily in areas of oil and nuclear pollution. Some of the international legal principles involved are reviewed. The organs representing international community concern for oil and radioactive pollution are the International Maritime Consultative Organization (IMCO) and the International Atomic Energy Agency (IAEA) respectively. The duties of these two agencies should be enlarged to include the control of the other sources of pollution. The problem of ocean disposal is discussed including the technical difficulties of preventing pollution, legal controls, and alternative means of massive waste disposal. Also included is a discussion of various pieces of legislation concerning the control of pollution and waste disposal. Many problems of the legal control of pollution remain unresolved, but there are some encouraging signs in the area of oil and nuclear pollution. There is a need to resolve the dispute over national jurisdiction and to create a broad gauged view of international problem resolution. (Waldron-Florida)
W72-14784

WATER QUALITY CONTROL WITH SYNTHETIC POLYMERIC FLOCCULANTS: EFFECT OF METAL IONS ON FLOCCULATION OF BIOCOLLOIDS,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. K. Dixon, and R. C. Tilton.
Available from the National Technical Information Service as PB-212 364, $3.00 in paper copy, $0.95 in microfiche. Completion Report 1972. 9 p. OWRR A-031-CONN (2).

Descriptors: *Flocculation, *Algae, *Silica, *E. coli, *Ions, *Wastewater treatment, *Polymers, Cations, Anions, Chlorella, Filtration, Electrophoresis, Tracers.
Identifiers: *Multivalent metallic cations, *Polyacrylamide, *Polyethylenemine, *Polystyrene sulfonate, Chlorella ellipsoidia.

Effect of the addition of multivalent metallic cations up to 0.02M on the rate of flocculation of pure algal cultures of Chlorella ellipsoidia by synthetic polymeric cationic polyethyleneimines (PEI) was found to be negligible. A hundredfold variation in the Mg (++) concentration present in nutrient used during the growth of these algae also had no effect on efficiency of flocculation of the algae by the PEI polymers. Addition of non-ionic polyacrylamide to the PEI polymers to the bacteria, E. coli, had no effect on their good performance. Addition of anionic polystyrene sulfonate polymers, which were ineffective alone, to PEI polymers decreased the flocculation performance of the latter for E. coli. Effects of the multivalent metallic cations and/or the use of anionic-cationic polymer mixtures for flocculating the complex dispersions present in commercial operations are often successful. The results on the simple algal and bacteria systems apparently cannot be translated into some guiding principles useful during the flocculation of the more complex commercial systems. On the other hand, the results of previous studies on flocculation of E. coli, algae and silica with radioactive tagged PEI polymers should be quite useful for application to commercial operations.
W72-14840

CORROSION POTENTIAL OF NTA IN DETERGENT FORMULATIONS.
Battelle Columbus Labs., Ohio.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-212 393, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1971. 94 p, 41 fig, 28 tab, 23 ref. EPA Program 16080 GPF 04/71.

Descriptors: *Corrosion, *Detergents, *Phosphates, *Nitrilotriacetic acid, Pollutants, Eutrophication, Plumbing, Stainless steel, Metals.
Identifiers: *Sodium tripolyphosphate, Laundering equipment.

Coupon-weight loss and linear polarization studies were employed to investigate the corrosion potential of nitrilotriacetic acid (NTA) which is a substitute for sodium tripolyphosphate (STPP) in detergents. Solutions of 0.06, 0.12, and 0.18 weight percent using 15- and 150-ppm water hardness and temperatures of 130 and 160F represented laundering conditions used by the average housewife. Types 304 and 420 stainless steel and 201 Nickel were very corrosion resistant (0.01 to 0.15 mil per year), 260 Brass, electrolytic copper and 1100 Aluminum were moderately resistant (0.2 to 3 mils per year) and die-cast zinc, 1020 carbon steel and chemical lead poorly corrosion resistant at rates of 2 to 60 mils per year. NTA detergents could increase metal ion pickup at a sewage plant by a factor between 1 and 7. (Smith-Texas)
W72-14851

PRELIMINARY INVESTIGATIONAL REQUIREMENTS-PETROCHEMICAL AND REFINERY WASTE TREATMENT FACILITIES.
Engineering-Science, Inc./Texas, Austin.
For primary bibliographic entry see Field 05D.
W72-14852

SOIL AND WATER RESEARCH TO MANAGE THE ENVIRONMENT,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
J. Van Schilfgaarde.
Journal of Soil and Water Conservation, Vol. 27, No. 2, p 50-51, March-April, 1972.

Descriptors: *Research and development, Agriculture, *Soil conservation, *Water conservation, *Environment, *Quality control, Waste disposal, City planning, Industries.

The Soil and Water Conservation Research Division of the Agricultural Research Service (ARS) is discussed in terms of its program objectives which have changed to meet demands for information re-

lated to environmental quality. ARS considers its duty is to provide as much pertinent data and as many guidelines as possible to enable continued prudent management of these resources. Two types of situations are examined: (1) agricultural activities which may adversely affect the environment and (2) how agricultural resources and knowledge can be used effectively to reduce problems unrelated to agriculture. In some ways, agricultural practices contribute to environmental degradation. However, agricultural resources and technologies can enhance environmental quality. Agricultural scientists and conservationists must face the challenge of environmental problems. It must be recognized that problems which exist in agriculture have to be solved. They must explore ways and means of using their knowledge of natural processes to help solve the waste problems of cities and industry. (StrachanChicago)
W72-14891

MAN AND HIS ENVIRONMENT: THE ISSUES IN PERSPECTIVE,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14892

OIL EXTRACTION, URBAN ENVIRONMENT, AND CITY PLANNING,
University of Southern California, Los Angeles.
M. C. Branch.
Journal of the American Institute of Planners, Vol 38, No 3, p 140-153, May 1972. 2 map, 25 fig, 20 ref.

Descriptors: *Oil pollution, *Environment, *City planning, *Regulation, *Control, Economic feasibility, Protection.
Identifiers: *Policy making, *Los Angeles (Calif), Requirements, Preventive provisions.

Oil exploration and production have taken place in Los Angeles for seventy-five years. Regulation of these activities has developed over the years without making it economically impossible. Today, improved city planning and greater urban environmental protection call for additional policies and requirements. This review of Los Angeles' experience is intended to assist the many communities in the world which are or will be faced with problems accompanying urban oil extraction. By studying the Los Angeles experience and modifying it to fit the local situation, cities can establish policies, laws, and regulatory conditions which allow urban oil operations consistent with sound city planning, urban development, and favorable local environment. Minimum requirements should include: (1) largest feasible oil-drilling districts, (2) minimum feasible number of drill sites and other required operating facilities, (3) minimum feasible size of drill sites, (4) conditional use zoning approval, (5) enclosure of property within a decorative wall, (6) other protection of surrounding area, (7) underground transportation of oil, (8) stringent preventive provisions, (9) separate consideration and insurance covering subsidence, (10) prohibition of oil extraction where underground geology indicates that subsidence or contamination of underground water supplies would occur, (11) unitization of oil districts by several oil companies, (12) prohibition of oil operations inimical to city planning, and (13) elimination of marginal wells. (Strachan-Chicago)
W72-14899

LIVING WITH OUT WASTES,
California Univ., Richmond. Sanitary Engineering Research Lab.
P. H. McGauhey.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 17-22.

Descriptors: *Engineering, *Waste disposal, *Pollution abatement, *Environment, *Quality control, Planning, Economic feasibility, Jurisdiction, Research and development, Technology.
Identifiers: *Waste philosophy, Policy making.

Quality as a factor in environment has no meaning except as it relates to some scale of health, happiness, comfort, and aspirations of man that ranges from the intolerable to the sublime. Pollution of the environment is the result of man's activities rather than the activities of nature. The engineer must play an important role in the development and construction of systems for removing pollutants from the gases and liquids discharged by industry, upgrading the quality of municipal and industrial waste waters, disposing of solid wastes on land, and in the development of industrial processes that produce less air, water, and land pollutants. What is needed is the development of systems and processes for returning unwanted materials to the basic resources on which industry and commerce thrive, thus reducing to a minimum the volume of wastes that must go into man's environment. Considerable research is being directed to this goal. Technological feasibility and imaginative engineering will not be enough. If man is to control the quality of his environment, he is going to have to accept regional jurisdictional systems of unprecedented nature, revise his concept of economic feasibility upward, and surrender much of his natural heritage of waste philosophy. (Strachan-Chicago)
W72-14901

A CITIZEN'S COMMENTS ON CONSERVATION,
Colorado House of Representatives, Denver.
For primary bibliographic entry see Field 06G.
W72-14903

NEW BIOLOGICAL AGENT FOR NATURAL SELF-PURIFICATION OF SURFACE WATERS,
Institute of General and Municipal Hygiene, Moscow (USSR).
R. M. Abieva.
Gig Sanit. Vol 36, No 4, p 72-75. 1971.
Identifiers: *Water purification, *Self-purification, *Bdellovibrio bacteriovorus, E. coli, Salmonella typhosa.

Literature is reviewed on the role of Bdellovibrio bacteriovorus in promoting self-purification of bodies of water. Its effect on the pathogenic microorganisms Escherichia coli, Salmonella typhosa, poliovirus and adenoviruses as well as mice is discussed. Bdellovibrio bacteriovorus activity is compared generally to the mechanism of bacteriophage activity.--Copyright 1972, Biological Abstracts, Inc.
W72-14904

WATER QUALITY CONTROL FROM A STATE VIEWPOINT,
Wyoming State Dept. of Public Health, Cheyenne.
A. E. Williamson.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 55-58.

Descriptors: *Water quality control, *State governments, *Wyoming, Water Quality Act, Standards, Classification, Planning, Decision making, Monitoring.
Identifiers: *Policy making, 'Trout standard', Criteria, Stream-by-stream basis, Implementation.

The water quality control program of the State of Wyoming is discussed. The Water Quality Act of 1965 specified that states will adopt water quality standards. The states can choose to establish standards on a broad classification or a stream-by-stream basis. Wyoming has carried out a program of effective water pollution control. It has been carried out without formalized standards, detailed plan of implementation, surveys, or continuous monitoring. The efforts are directed to the selling of the need for waste treatment facilities and getting them constructed. Perhaps the only water quality standard used was that of a 'trout standard'. States using a criteria and classification system of control have had more controversy in the public hearings than states using the specific standards approach. In the development of standards, a basic concept should be to keep the number of parameters to a minimum. The criteria and classification method establishes standards for parameters on many streams where the pollutants do not exist or where they are of no value. One group, and preferably an individual, should be responsible for final decisions on the adequacy, reasonableness, and practicality of the final standard or criteria. It would appear that only a person who is well versed in the state's plans, progress, and development, and who has a definite responsibility, can hope to arrive at standards which are equitable to all. (Strachan-Chicago)
W72-14905

METROPOLITAN GROWTH -- ENCROACHMENT OR ORDERLY PROCESS,
Department of Housing and Urban Development, Washington, D.C. Land and Facilities Development Administration.
A. A. Davis.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 201-208.

Descriptors: *City planning, *Urbanization, *Environment, Quality control, Planning, Coordination, Governments, Comprehensive planning, Regulation, Land development, Flexibility.
Identifiers: *Metropolitan resources management, Implementation.

Urban communities are only another form of environment. Moving toward the central city, the rural fringes merge into the urbanized area in an unbroken continuum. The urban community must be viewed in a larger context of natural and man-made qualities. The fate of the farmer and the suburbanite are closely linked. In education, people are trained in land use and management problems almost exclusively identified with farms and agriculture. It is more useful to view the city as an organism, dependent upon the environment for its well-being. Metropolitan systems are remarkably analogous to those considered in resource development programs. Several suggestions for more effective solution of urban problems are presented. (1) Planning must be made more meaningful. (2) There must be more effective coordination between government agencies to develop and implement comprehensive plans. (3) There must be a focus on total problem solving, not on institutional considerations and hierarchical arrangements. (4) There must be effective public regulation of development. (5) There is a need for more imaginative and flexible means of protecting the quality of the urban environment. (6) There must be discipline to the need for making choices. Only when resource specialists, urban planners, and administrators recognize more fully the need for cooperation between the city, suburb, and small town can improved quality of urban life be achieved. Then, metropolitan growth will be a truly ordered process, meeting the needs of man. (Strachan-Chicago)
W72-14910

BOULDER, COLORADO: A STUDY IN GROWTH,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 03D.
W72-14912

ECONOMIC GROWTH AND ENVIRONMENTAL COSTS,
Coe Coll., Cedar Rapids, Iowa.
For primary bibliographic entry see Field 06G.
W72-14913

ENVIRONMENTAL PLANNING ALONG MONTANA'S BLUE-RIBBON TROUT STREAMS,
Montana State Univ., Bozeman. Water Resources Research Center.
S. S. Frissell.
Available from the National Technical Information Service as PB-212 388, $3.00 in paper copy, $0.95 in microfiche. Montana Water Resources Research Center Completion Report No. 31, (1972) 19 p, 10 tab. OWRR A-047-MONT (1).

Descriptors: Water resources development, *Planning, *Environment, *Land use, *Recreation, *Attitudes, Streams.
Identifiers: Scenic preservation, Stream classification, Environmental corridors, Trout streams.

A stream classification system adopted in 1959 identified seven Montana waterways as 'Class 1--streams of national as well as state-wide significance.' This classification was applied to portions of Rock Creek and the Flathead, Big Hole, Gallatin, Madison, Yellowstone and Missouri Rivers. This study describes the current ownership and land-use patterns along six of these streams (Missouri excluded). Between 45 and 85 per cent of the stream banks are in private ownership. Current land uses are predominately ranching and forested lands. Several situations are identified which could threaten the environmental corridors of the Blue-ribbon streams. Posting of private lands occurred on up to 22 per cent of the lands adjacent to the rivers. Large ranches are being subdivided into small lots. Homes, cabins, resorts and businesses are being developed adjacent to the streams. An investigation of stream user attitudes indicate that a majority are attracted by the natural environment of the stream and are in fact antagonistic toward excessive development. Several alternative solutions to the pending stream preservation problem are identified.
W72-14923

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 08D.
W72-14926

ERIE HARBOR, PENNSYLVANIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-209 049-D, $3.00 in paper copy. April 20, 1972. 4 p, 4 map.

Descriptors: *Pennsylvania, *Lake Erie, *Environmental effects, *Channel improvement, *Dredging, Spoil banks, Maintenance, Navigation, Navigable waters, Sediment, Sediment transport, Deposition (Sediments), Harbors, Water pollution, Water pollution control, Water pollution sources, Sedimentation.
Identifiers: *Environmental Impact Statements, *Erie Harbor (Pa).

The project involves the recurring maintenance of the channels and structures in the deep draft navigation project for Erie Harbor, Pennsylvania. The primary work involves the annual dredging of approximately 300,000 cubic yards of sediment from the channels and dumping the material into Lake Erie. The impact of the dredging is apparent in short-term increases in turbidity and sedimentation, both in the dredging and disposal areas. The disposal area has been located to avoid spawning areas and at a location where currents will not carry suspended material toward water intakes. Disposal of dredged material in the lake transfers polluted material from the harbor into open lake waters. It has proven difficult to make quantitative measures of the adverse effects; however, in view of the degradation of the lake's water resulting from the combined effects of pollutants from many sources, removal rather than relocation of polluted spoil would be desirable. No practical alternatives to the present methods of maintenance have been found. However, as an alternative to lake disposal of spoil, four land sites have been considered for construction of an enclosed area to permanently confine the material. (Ellis-Florida)
W72-14927

WALLISVILLE LAKE, TRINITY RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 08A.
W72-14929

DISCHARGING NEW WINE INTO OLD WINESKINS: THE METAMORPHOSIS OF THE RIVERS AND HARBORS ACT OF 1899,
R. L. Potter.
University of Pittsburgh Law Review, Vol. 33, No. 3, p 483-531, 1972. 197 ref.

Descriptors: *Rivers and Harbors Act, *Watercourses (Legal aspects), *Legislation, *Judicial decisions, Water pollution control, Water quality control, Water quality standards, Water law, Legal aspects, Federal government, Industrial wastes, Navigable waters, Waste disposal, Federal Water Pollution Control Act, Pollution abatement, Permits, Navigation, Law enforcement, Federal-state water rights conflicts, Water pollution sources, State governments.
Identifiers: *Refuse Act, *Statutory construction.

Section thirteen of the Rivers and Harbors Act, imprecisely referred to as the Refuse Act, has been rescued from anonymity and has become the new champion in the battle for water quality. The development of the statutory construction placed on the Act is traced with a discussion of its conflict with the Federal Water Pollution Control Act of 1965 and the implementation of the Refuse Act Permit Program for industrial discharges. There follows the legislative history of the Act, starting with the New York Harbor Acts of 1866 and concluding with a careful examination of the legislative proceedings leading up to its enactment. The judicial history of the Act is included, with special emphasis on two leading Supreme Court decisions. Other federal laws relating to water pollution are noted as being incompatible with the 1899 law. A close examination of the legislative history of the 1899 Act leads to the conclusion that the Refuse Act was intended to apply only to refuse which obstructed navigation. If Congress really wants to require a permit for the discharge of all and any substances into navigable waters then such a requirement should be put in the Federal Water Pollution Control Act. (Brackin-Florida)
W72-14935

EVOLVING SOCIAL ATTITUDES ON POLLUTION CONTROL,
Cincinnati Univ., Ohio. Environmental Health Engineering.
E. J. Cleary.
Journal of American Water Works Association, Vol. 64, No. 7, p 405-409, July 1972. 5 p, 4 photo.

Descriptors: *Social values, *Water policy, *Pollution abatement, *Water pollution control, Attitudes, Water pollution, Beneficial use, Legal aspects, Wastes, Public health, Human diseases, Social change, Competing uses, Waste disposal, Water quality control, Water quality, Wastes treatment, Treatment facilities, Grants.
Identifiers: *Zero discharge, Social attitudes (Pollution).

Since 1900 public attitudes toward water pollution have gone through four distinct but overlapping phases, ranging from acceptance of foulness to the current aspirations for pristine purity. At the beginning of this century the primary basis for curbing water pollution was prevention of waterborne disease and minimization of local nuisances. A greater awareness of the public-welfare aspects of water pollution developed from 1920 to 1940, although water pollution was still rationalized as the inevitable penalty of progress. Nevertheless, as a result of the need for public works programs during the depression, progress was made in the construction of sewage-treatment facilities. During the 1940's it was reasoned that the appropriate goal for pollution-control efforts should be that which would offer the greatest benefits in the use of waterways. More recently the positive policy of keeping the waters as clean as possible has equated the beneficial use of water to the maintenance of its highest quality. This 'zero discharge' policy has had its primary impetus from the expansion of federal jurisdiction and spending in pollution-abatement. Recent failures suggest that something may be wrong with our goals and strategy. (Crow-Florida)
W72-14936

TEST TO DETERMINE THE COMBINED EFFECTS OF WAVES AND CURRENTS ON BARRIER MOTIONS AND OIL RETENTION EFFICIENCY IN ROUGH WATER. POINT CONCEPTION, CAL. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.

March 14, 1972. 34 p.

Descriptors: *Environmental effects, *Oil pollution, *Oil, *Testing, Currents (Water), Waves (Water), Effects, Retention, Testing procedures, Sea water, Oceans, Theoretical analysis, Water pollution, Water pollution control, Water pollution sources, Benefits, Costs, Feasibility, Habitats, Ecosystems, Barriers, California.
Identifiers: *Environmental Impact Statements, *Point Conception (Cal), *Oil barrier tests.

The project will involve the conduct of full scale testing of the high seas oil containment barrier, in order to furnish verification of the prototype design. The test will determine the combined effects of waves and currents on barrier motions and oil retention efficiency in rough water. The rough water test with non-toxic, biodegradable soybean oil will describe barrier performance as well as mechanisms of oil failure in 3-5 foot seas. The test will involve an area 5 to 30 miles at sea west of Point Conception, California. The proposed test will establish the validity of experimentally derived theories concerning oil losses by entrainment and drainage failure. Thus future engineering design capability will be enhanced and the requirements for future full scale testing with oil reduced. There is no known impact on ecological systems such as wildlife, fish, and marine life. The selection of test procedures, site, and materials coupled with extensive previous experience minimizes the risk of possible ecological damage. Since there are no known adverse effects from the action proposed, no alternative plan has been suggested. (Ellis-Florida)
W72-14937

WATER QUALITY STANDARDS SUMMARY FOR THE INTERSTATE WATERS OF NEBRASKA.
Environmental Protection Agency, Washington, D.C.; and Nebraska State Dept. of Environmental Control, Lincoln.

March 1972. 36 p, 18 fig, 1 tab, 3 append.

Descriptors: *Water quality standards, *Interstate rivers, *Nebraska, *Water Quality Act, *Water quality control, Water pollution control, State governments, Federal governments, Pollution abatement, Regulation, Municipal wastes, Industrial wastes.

The standards for interstate waters adopted by the State of Nebraska and approved by the U.S. Environmental Protection Agency in June 1971 are presented. The standards consist of three major components: (1) designation of the uses which interstate waters are to serve, (2) specification of narrative and numerical criteria to protect and enhance water quality, and (3) specification of a plan of implementation and enforcement, which includes treatment and control requirements for municipal, industrial and other wastes discharged to or affecting interstate waters. These components are discussed. (Woodard-USGS)
W72-14956

AN ANALYSIS OF THE CONCENTRATIONS OF HEAVY METALS IN MONTEREY HARBOR UTILIZING THE METHODS OF ATOMIC ABSORPTION SPECTROPHOTOMETRY AND POLAROGRAPHY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W72-14964

APPARATUS FOR REMOVING FLOATING POLLUTANTS,
D. Usher.
U. S. Patent No. 3,578,171, 4 p, 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 886, No 2, p 296, May 11, 1971.

Descriptors: *Patents, *Oil pollution, *Oil spills, Equipment, *Pollution abatement, Water pollution control, Water pollution treatment, Flotsam.

A self propelled barge carries equipment for the removal of oil or other hazardous floating pollutants from a body of water. It carries a vacuum tank, a combination suction and pressure tank, a buoyant slick bar, a skimmer suspended from the barge and having a flexible conduit connecting with the vacuum tank, and several settling tanks. A power operated air blower is mounted on the deck for moving an area of floating pollutant into the confinement provided by the slick bar. (Sinha-OEIS)
W72-14970

FLOATING BARRIER MEANS,
Pneumatiques, Caoutchouc Manufacture et Plastiques Kleber-Colombes (France). (assignee).
R. E. Ducrocq.
U. S. Patent No. 3,577,879, 4 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 886, No 2, p 225, May 11, 1971.

Descriptors: *Patents, Barriers, *Oil pollution, *Oil spills, Equipment, *Pollution abatement, Water pollution control, Water pollution treatment.

This barrier is composed of a series of floating parts, each of which comprises both an inflatable tube and a flexible skirt. A flexible reinforcing element is located in a channel in the upper portion of the skirt. The barrier is used to limit the spread of a pollutant such as oil and make it possible to recover the oil. (Sinha-OEIS)
W72-14971

METHOD FOR DISPERSING OIL SPILLS ON WATER,
Gulf Research and Development Co., Pittsburgh, Pa. (assignee).
S. C. Paviak, and W. K. Porter.
U. S. Patent No. 3,577,340, 4 p, 6 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 99, May 4, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, Water pollution control, Water pollution treatment, *Dispersion, Chemical reactions.
Identifiers: *Chemical treatment, *Oil dispersion.

A novel formulation of alkylphenol ethoxylate is used to cause the dispersion of patches of oil floating on water. Five examples illustrate its successful use. In applying the dispersant, it is convenient to use a suitable sprayer-equipped airplane and utilize the natural wave action to provide the mixing-dispersing effect. In the absence of wave action, agitation may be created by one or more boats passing through the sprayed area. (Sinha-OEIS)
W72-14974

MARINE OIL BOOM,
D. H. Rowland.
U. S. Patent No. 3,576,108, 4 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 885, No 4, p 668, April 27, 1971.

Descriptors: *Patents, *Oil pollution, Oil spills, Equipment, *Pollution abatement, Separation techniques, Water pollution control, Water pollution treatment.
Identifiers: *Oil booms.

Elongated flexible buoyant tubes formed of oil resistant, rubberlike material having an accordion-pleated wall, are connected end to end to form a barrier around an offshore well or extending along a coastline area. The barrier may be anchored in place. (Sinha-OEIS)
W72-14980

PROCESS FOR PURIFYING WATER CONTAINING OIL AND SOLIDS,
For primary bibliographic entry see Field 05D.
W72-14987

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

ECONOMIC VALUE OF WATER IN A SYSTEMS CONTEXT,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 06B.
W72-14236

OPTIMUM OPERATIONS MODEL FOR SHASTA-TRINITY SYSTEM,
Bureau of Reclamation, Sacramento, Calif. Water and Power Control Division.
For primary bibliographic entry see Field 04A.
W72-14384

COMMENTS ON 'NONLINEAR PROGRAMMING APPLIED TO REGIONAL WATER RESOURCES PLANNING' BY G. K. YOUNG AND M. A. PISANO,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
R. T. Milhous.
Water Resources Research, Vol 8, No 4, p 1118-1122, August 1972. 1 fig, 4 tab, 3 ref.

Descriptors: *Water conveyance, *Linear programming, Water resources development, *Planning, *Regional analysis, Optimization, *Marginal costs, *Pipes, Model studies, Operations research, Electrodialysis, Waste treatment.
Identifiers: *Nonlinear programming, *Regional planning, Water transport.

Evidence is presented of how Young and Pisano's nonlinear programming problem can be reformulated as a linear transportation problem, and how the specifications developed prior to the application of the programming technique result in a higher cost solution than results from a minor change in the specifications. The major nonlinearity in the problem solved by Young and Pisano is the cost function for the pipes used to transport water from a source to a demand area. Because the marginal cost curves are nonlinear, a strategy is developed by Milhous to transform the nonlinear total cost equation to a linear marginal cost equation. The marginal costs used in the linear programming are obtained by adding the marginal cost of transporting an additional unit of water to the marginal cost of developing an additional unit at the source. Results of Milhous' review show that (1) the linearization of the problem reduces the solution to a simple transportation tableau that can easily be solved by hand without the use of a computer, and (2) the basic specification of the problem eliminated a solution with a lower cost than the optimal solution given. (See also W70-05701) (Bell-Cornell)
W72-14385

RIVER DEE RESEARCH PROGRAM: 1. OPERATING MULTIPURPOSE RESERVOIR SYSTEMS FOR WATER SUPPLY AND FLOOD ALLEVIATION,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14386

RIVER DEE RESEARCH PROGRAM: 2. A LONG-TERM CONTROL STRATEGY FOR A MULTIPURPOSE RESERVOIR,
Lancaster Univ. Baillrigg (England).
For primary bibliographic entry see Field 04A.
W72-14387

RIVER DEE RESEARCH PROGRAM: 3. A SHORT-TERM CONTROL STRATEGY FOR MULTIPURPOSE RESERVOIR SYSTEMS,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14388

WATER RESOURCE MANAGEMENT IN NORTHERN MEXICO,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 03F.
W72-14389

METHODS FOR PREDICTING URBAN DRAINAGE COSTS,
Agriculture Research Service, Boise, Idaho. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W72-14390

VERMONT WATER QUALITY SIMULATION PROJECT REPORT,
Thayer School of Engineering, Hanover, N.H.
For primary bibliographic entry see Field 05B.
W72-14392

THE EVALUATION OF INTANGIBLE BENEFITS OF WATER RESOURCE PROJECTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W72-14422

VACATION HOME LOCATION: A MODEL FOR SIMULATING THE RESIDENTIAL DEVELOPMENT OF RURAL RECREATION AREAS,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 06B.
W72-14425

THE IMPORTANCE OF ECONOMIC FACTORS IN URBAN WATER SUPPLY SYSTEMS,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 06B.
W72-14430

WATER RESOURCES PLANNING STUDIES OKLAHOMA AND ARKANSAS, PHASE II (QUALITY),
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
For primary bibliographic entry see Field 05G.
W72-14432

COMPREHENSIVE WATER AND SEWERAGE STUDY.
San Joaquin County Advisory Planning Association, Stockton, Calif.

Descriptors: *Planning, *Sewage treatment, *Sewerage, *Water resources, *Water supply, California, Water demand, Forecasting, Long-term planning, Regional analysis, Water quality, Coordination.
Identifiers: *Regional planning, *San Joaquin (Calif).

To assure adequate water supplies for the future, both short-range and long-range planning must be undertaken and implemented. Eight general policies have been adopted by the Cities and County of San Joaquin Advisory Planning Association. Some of these are: (1) assurance of the adoption of long-range sewerage system management planning for each community, (2) assurance of long-range water supply planning by each community, (3) evaluation of the needs of all persons in the area, and (4) evaluation of the feasibility of consolidation of local sewerage and water systems wherever possible. The Associateion's priorities for the area are three-fold, namely: (1) correction of existing water supply, (2) projects to correct deficiences in water quality or supply due to long-range growth, and (3) projects involving the consolidation of municipal systems to meet long-range demands. (Poertner)
W72-14447

MODELS FOR THE SYNTHESIS OF MONTHLY STREAMFLOWS FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 02E.
W72-14640

A WATER QUALITY MODEL FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05B.
W72-14641

SPACE-TIME ANALYSIS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel.
Paper presented at Symposium on Applied Sensing of Earth Resources in Arizona, Tucson, November 3, 1971, 21 p, 10 fig, 2 tab, 23 ref. OWRR B-007-ARIZ (22).

Descriptors: *Data collections, *Data processing, *Hydrology, *Environment, Decision making, Systems analysis, Forecasting, Mathematical models.
Identifiers: *Space-time analysis, *Data analysis, *Environmental data processing, Data networks, Problem-solving.

Classes of problems in space-time sampling are identified, basic concepts on sampling are presented, and questions are posed about methods of space-time analysis in a modeling, economic and decision framework. Examples are drawn primarily from hydrology and water resources. The last few years have witnessed a substantial growth of interest in environmental data collection and analysis: Data is collected to promote understanding of systems and processes, to aid in decision making, and to solve problems. However, what seemingly is lacking is a more formal mathematical, statistical, economic and decision basis for the analysis of existing data and for the optimal design of new data networks. In order to cope with newer water management problems, more rational planning and operational models have been constructed but their application is compromised by limited available data. Data are increasingly expensive to obtain and oftentimes used inappropriately in that they do not efficiently relate to the needs of the particular study. Therefore, more formal data analysis is needed before diverting sizeable fractions of budgetary resources for increasingly larger-scale observational systems. Space-time sampling of static and dynamic systems is designed to reduce the uncertainty connected with long-term prediction of the environmental processes and short-term operational forecasts. (Bell-Cornell)
W72-14643

UTILIZATION OF AN INPUT-OUTPUT MODEL FOR PREDICTING WATER DEMAND ON A SMALL WATERSHED,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
W. J. Bellows.
Ph D Thesis, August, 1971. 123p, 1 fig, 8 tab, 33 ref, 6 append. OWRR B-004-MASS (6).

Descriptors: *Watershed management, *Input-output analysis, *Economics, *Forecasting, *Data collections, *New England, *Water demand, *Water use, *Industries, Planning, Estimating, Operations research, Model studies, *Massachusetts.
Identifiers: *Millers River watershed, Quabbin reservoir.

Presented is a study that was undertaken to determine the feasibility of studying the economy of a small watershed by means of an input-output model, and to examine the use of the model for estimating water demand for industrial purposes. Because of the importance of import and export trade to a small area economy, primary data collection emphasizing the location of suppliers and customers was chosen to obtain required information; personal interviews yielded best results and were used almost exclusively. The economic structure of the Millers River Watershed in western Massachusetts is examined. The total industrial water intake in the watershed is estimated by using Leontief inverse matrix and water-use coefficients to obtain a matrix of water-use interactions coefficients. The coefficients are then evaluated as to their usefulness in planning water use. Results show that it is possible to compile a transactions table for a small watershed from primary data sources. The tables show a fairly low level of interindustry transactions, however, thus calling into question the value of using input-output analysis for small watershed economics, since its usefulness is greatest when there are many interdependencies and least when there are few. The input-output model has potential as a tool for regional industrial planners. (Bell-Cornell)
W72-14644

THE PRACTICAL APPLICATION OF DYNAMIC PROGRAMMING TO RESERVOIR SYSTEMS WITH PUMPED INPUTS,
Water Research Association, Medmenham (England).
For primary bibliographic entry see Field 04A.
W72-14646

6B. Evaluation Process

POTENTIAL UNITED STATES WATER--SUPPLY DEVELOPMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-14217

ECONOMIC VALUE OF WATER IN A SYSTEMS CONTEXT,
Washington State Univ., Pullman.
W. R. Butcher, N. K. Whittlesey, and J. G. Orsborn.
Available from the National Technical Information Center, Springfield, Va. 22151, as PB-210 357 for $6.00 paper copy. National Water Commission Report No. SBS 72-048, May 1972, 188 p, 15 fig, 33 tab, 36 ref. NWC 71-007.

Descriptors: *Cost-benefit analysis, *Water values, *Value, *Economics marginal benefits, *Evaluation, Water resource development, Irrigation, Recreation, Fish and wildlife, Navigation, Hydro-electric power, Systems analysis.
Identifiers: *Waste assimilation, Yakima River, Columbia River, Susquehanna River.

Decisions about water allocation and investment in water resource developments could be improved by knowledge of the value of water in alternative uses. The interdependent system in which water resources occur and uses take place make it important to consider these water values in a systems context. Systems models provide the most systematic approach to estimating these values but much can be learned through a careful description of effects that each use has not only on quantity of water but also on quality and time or place of availability. Application of systems analysis to the Yakima, Columbia and Susquehanna Rivers illustrates the approach and provides examples of the significance of a systems approach to water valuation. (See also W72-14237) (NWC)
W72-14236

THE ECONOMIC VALUE OF WATER: CONCEPTS AND EMPIRICAL ESTIMATES,
Colorado State Univ., Fort Collins. Dept. of Economics.
R. A. Young, and S. L. Gray.
Available from National Technical Information Service, Springfield, Va. 22151, as PB-210 356 for $9.00 paper copy. National Water Commission Report no. SBS 72-047, March 1972, 347 p, 7 fig, 17 tab, 182 ref. Contract NWC 70-028.

Descriptors: *Cost-benefit analysis, *Water values, *Value, *Economics marginal benefits, *Evaluation, Water resources development, Irrigation, Recreation, Fish and wildlife, Navigation, Hydro-electric power.
Identifiers: *Waste assimilation.

Conceptually valid and empirically sound estimates of water values are essential for rational allocation of water among uses and users over time. The study was divided into two parts. In the first part, a number of issues are examined that must be taken into account in deriving conceptually valid estimates of the values of water. These issues include (1) defining the quantity of water used in both instream and withdrawal uses, (2) assuring comparability of use in terms of time, location and quality, (3) choice of accounting stance, national, regional or individual, and (4) maintaining a distinction between long run and short run values

where water is used for production of consumer goods. The second part of the study involves analysis of water values for various uses with attention to regional differences. This analysis employs the conceptual approach developed initially and considers numerous previous studies from an exhaustive literature review. The water uses considered are municipal, industrial, irrigation, waste assimilation, recreation, fish and wildlife, navigation and hydroelectric production. (See also W72-14236) (NWC)
W72-14237

INTERGOVERNMENTAL RELATIONS IN WATER RESOURCES ACTIVITIES.
Wendell and Schwann, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14238

A MATHEMATICAL-PROGRAMMING MODEL FOR PLANNING A REGIONAL WATER RESOURCE SYSTEM,
Water Resources Board of England and Wales.
P. G. O'Neill.
Journal of the Institution of Water Engineers, Vol 26, No 1, p 47-71, Feb 1972. 15 p, 3 fig, 8 ref.

Descriptors: *Mathematical models, *Planning, *Water plans, Estimated costs, *Optimum development plans, *Water resources development, Future planning (Projected), Water sources, Water demand, Long-term planning, Water resources, Mathematical analysis, Computer models, Investment, Water utilization, Linear programming, Costs, Computer applications.
Identifiers: Water demand mathematical models, Great Britain, Water resources systems, Foreign studies.

A mixed-integer programing technique is applied to planning the development of water resources for a region over a 30-yr period. The model determines a plan for minimizing the total discounted construction and operation costs, subject to growing demands for water up to the yr 2001, and assuming constant demand thereafter. Sources (reservoirs, groundwater zones, effluent returns, estuarial storage, desalination plants and imports from outside the region) and links (pipelines or tunnels, treatment works, pumping stations, and river channels) are included in the system model. Demands may be either for public supply (excluding costs of the local distribution network) or for direct industrial, commercial, or agricultural use. The model determines capital investment, allocates water flows, and provides information on current costs, and indicates long-run marginal cost trends at each of the notional centers of demand. Acknowledging that input data are subject to uncertainty, nevertheless output data from several runs should be analyzed to gain insight on the development of the regional network. (USBR)
W72-14242

ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING, AND MANAGING WATER RESOURCES IN AGRICULTURE.
Economic Research Service, Madison, Wis.
For primary bibliographic entry see Field 03F.
W72-14256

COMMENTS ON 'NONLINEAR PROGRAMMING APPLIED TO REGIONAL WATER RESOURCES PLANNING' BY G. K. YOUNG AND M. A. PISANO,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-14385

RIVER DEE RESEARCH PROGRAM: 1. OPERATING MULTIPURPOSE RESERVOIR SYSTEMS FOR WATER SUPPLY AND FLOOD ALLEVIATION,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14386

RIVER DEE RESEARCH PROGRAM: 2. A LONG-TERM CONTROL STRATEGY FOR A MULTIPURPOSE RESERVOIR,
Lancaster Univ. Baillrigg (England).
For primary bibliographic entry see Field 04A.
W72-14387

RIVER DEE RESEARCH PROGRAM: 3. A SHORT-TERM CONTROL STRATEGY FOR MULTIPURPOSE RESERVOIR SYSTEMS,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14388

WATER RESOURCE MANAGEMENT IN NORTHERN MEXICO,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 03F.
W72-14389

METHODS FOR PREDICTING URBAN DRAINAGE COSTS,
Agriculture Research Service, Boise, Idaho. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W72-14390

USE OF SYSTEMS ANALYSIS IN WATER RESOURCE PLANNING,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
W. K. Johnson.
Journal of the Hydraulics Division, Proceedings, American Society of Civil Engineers, Vol 98, No HY9, Proceedings paper 9174, p 1543-1556, September 1972. 7 tab, 3 ref.

Descriptors: *Systems analysis, *Planning, *Surveys, Organizations, *Decision making, Social aspects, Management.
Identifiers: *Water resources systems, Systems engineering.

Data, and conclusions based upon that data, are presented on the current use of systems analysis in the actual planning of water resource systems. Information was gathered from federal, state, regional, local, and private organizations, through the use of questionnaires, interviews, and a literature review. The survey poses three basic questions: (1) To what extent is systems analysis being used; (2) what are the main obstacles to its greater use; and (3) how has systems analysis affected decisions during the planning process. Survey results indicate that systems analysis has been used recently in most of the organizations, with preference being given most often to simulation models. The major obstacle to increasing the use of systems techniques for planning seems to be a lack of information being provided for practioners to assist them in assessing the capability and overall value of systems analysis; journals and technical literature need to present more information of the capability, limitations, costs, and availability of systems analysis, with data coming from actual real world applications. Moreover, in-house applied research activity must be increased. Finally, the impact of systems analysis upon the actual decision making processes within the organizations themselves is not clearly ascertained from the survey. (Bell-Cornell)
W72-14391

MEASURING ATTITUDES TOWARD WATER USE PRIORITIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
J. A. Ballweg.
Available from the National Technical Information Service as PB-212 166, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, Bulletin No. 50, April 1972. 135 p, 36 tab, 50 ref, 3 append. OWRR A-038-VA (2).

Descriptors: Water resources development, Water users, Water utilization, Attitudes, Priorities, Income, Age, Education, Multiple purpose, *Virginia.
Identifiers: *Likert scales, *Semantic differential scale, Sex, Smith Mountain Lake (Va).

Two techniques are employed to measure attitudes toward dual use of water resources. The study subject is Smith Mountain Lake, located in Southwestern Virginia, which is used both for recreation and hydroelectric generation. The sample population interviewed consisted of 134 males and 173 females from Roanoke, Virginia. The instruments used to evaluate the interviewees' responses were (1) a sixteen-item Likert scale, and (2) a seven-point semantic differential scale. While the composite Likert scale displayed a moderate degree of unidimensionality (.546), the four subscales designed to measure the dimensions of relevance, powerlessness, involvement, and deference failed to demonstrate the expected internal consistency. The semantic differential technique was somewhat more successful. It indicated that the degree of orientation toward water resources was positively correlated with education and income, and negatively correlated with age. Also, men tended to be more resource-oriented than women. The semantic differential scale also tested for power orientation. The study indicates that both the Likert scale and the semantic differential may be of some utility in determining, accurately and systematically, the public's attitudes toward water use priority. A sample interview instrument is included in an appendix. (Settle-Wisconsin)
W72-14417

A PERSPECTIVE ON ECONOMIC IMPACT,
Kentucky Water Resources Inst., Lexington.
L. D. James.
Available from the National Technical Information Service as PB-212 154, $3.00 in paper copy, $0.95 in microfiche. Research Report No. 37, March 1972. 121 p, 1 fig, 2 tab, 56 ref. OWRR A-006-KY (11).

Descriptors: *Reservoirs, *Economic impact, *Estimated benefits, *Project planning, *Economic justification, Flood damage, Recreation, Employment, Income, Property values, Land use, Institutions, Constraints, *Kentucky, *Ohio.

In order to provide water resource managers with a useful planning methodology, the economic impact of five reservoirs or reservoir complexes is studied. The study subjects are (1) West Fork of Mill Creek Reservoir in Hamilton County, Ohio, (2) Dewey Reservoir in Floyd County, Kentucky, (3) Rough River Reservoir in Grayson and Breckenridge Counties, Kentucky, (4) Wolf Creek Dam in Kentucky, and (5) a group of fifteen reservoirs in the Muskingum River basin in South Central Ohio. Analysis of the impact of these reservoirs proceeds by analyzing fourteen specific impact issues. These issues are reservoir effects on local property values, reservoir effects on the economy of the local county, changes in income and employment patterns around large reservoirs, patterns of land use change around reservoirs, reservoir effects on revenues and expenditures of local governments, reservoir recreation benefits, application of marginal economic analysis to reservoir recreation planning, economic value of natural areas for recreational hunting and for stream

fishing, the personal value of real property to its owner, reservoirsassociated income redistribution, demand-oriented reservoir operations, estimation of flood damages, and operation of reservoir systems for flood control. (Settle-Wisconsin)
W72-14418

THE PLAN FOR RECREATION DEVELOPMENT,
National Park Service, Western Regional Office. San Francisco, Calif.
E. F. Bullard.
Available from the National Technical Information Service as PB-207 554-D, $3.00 in paper copy, $0.95 in microfiche. March 1972. 116 p, 21 fig.

Descriptors: *Water resources development, *Recreation, *Lakes, *Planning, Management, Developed waters, Parks, Costs, Estimating, *California.
Identifiers: *Plan objectives, Development, *Lake Berryessa (Calif).

A plan for the development of the Lake Berryessa Basin is presented. It assumes that the purpose for developing Lake Berryessa is to make available to the San Francisco Bay, Sacramento, and Stockton region a water-oriented recreation area, providing the maximum amount of recreational opportunities compatible with conservingthe resources for future generations and complementary to other recreational opportunities within the region. The specific objectives of the plan are to (1) give highest priority to developing facilities that meet the public needs, (2) provide a balanced variety of public recreational opportunities, (3) provide adequate circulation systems to assure full enjoyment of park resources, (4) provide for the public's safety, (5) acquire lands necessary to implement the plan, (6) provide for adequate information dissemination, (7) provide for the needs of the residents of urban impacted areas, (8) develop architectural controls to assure harmonious development, (9) encourage educational programs that will utilize the park facilities, and (10) encourage research programs compatible with the recreation use of the area. Implementation of the plan would probably proceed best under federal management, although state management is not ruled out. Estimates of the cost of plan implementation are provided. (Settle-Wisconsin)
W72-14421

THE EVALUATION OF INTANGIBLE BENEFITS OF WATER RESOURCE PROJECTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
S. E. Gauger.
Massachusetts University, Amherst, Master's Thesis, February, 1972. 130 p, 12 fig, 44 photos, 7 tab, 57 ref, 6 append. OWRR B-017-MASS (1).

Descriptors: *Water resources development, *Intangible benefits, *Evaluation, Photography, Sites, Recreation, Cost-benefit analysis.
Identifiers: *Q-sort methodology, Factor analysis.

Development and application of a conceptual and mathematical approach for analyzing subjective responses to the appearance of the landscape around water resource projects is necessary if intangible benefits are to be included in cost-benefit analysis. One possible approach to analyzing subjective preferences is tested within the structure of the following hypothesis: 'If a photograph is one-half man dominated (evidence of man induced change), and one-half nature dominated (elements of both natural characteristics and man induced change), then people will not pick this case as a most preferred photo.' Data for testing this hypothesis was obtained by having subjects choose among 44 photographs according to Q-sort methodology. Factor analysis was then used to test the hypothesis. It was expected that photos of natural sites and of orderly developed sites would score high. However, people did not seem to equate naturalness with aesthetic appeal. Developed sites were interpreted as aesthetic, provided they were designed to fit in with the natural landscape. This study indicates that through the use of Q-sort methodology and factor analysis actual preferences may be incorporated into cost-benefit analysis. (Settle-Wisconsin)
W72-14422

VACATION HOME LOCATION: A MODEL FOR SIMULATING THE RESIDENTIAL DEVELOPMENT OF RURAL RECREATION AREAS,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
R. J. Burby, III, T. G. Donnelly, and S. F. Weiss.
Presented at: Annual Meeting of the Southern Regional Science Association, April 13-14, 1972, Williamsburg, Virginia. 52 p, 3 fig, 8 tab, 1 append. OWRR B-012-NC (10).

Descriptors: *Reservoirs, *Recreation, *Reservoir operation, Planning, Forecasting, *Simulation analysis, *North Carolina, *Georgia, Land use, *Computer models, Model studies.
Identifiers: *Reservoir management, *Residential development, *Lake Norman (NC), *Lake Sidney Lanier (Geo).

The characteristics of the residential development process in reservoir recreation areas is examined, and a computer model for simulating this process is proposed. Interviews with landowners, developers, and residents in the areas near Lake Norman, North Carolina, and Lake Sidney Lanier, Georgia, suggest that several attractiveness factors may be important in determining the location of residential development. These factors include physical characteristics of the area, accessibility to the reservoir, accessibility to roads and activity centers, institutional characteristics of the area, and changes in accessibility and institutional characteristics. The proposed simulation model is an adaptation of the Chapin-Weiss-Donnelly Probabilistic Model for Residential Growth. The model simulates reservoir area residential location decisions through a randomizing procedure in which households are assigned to sites on the basis of the supply of land available and its attractiveness for recreational and permanent residential use. Test runs of the model for the Lake Norman and Lake Lanier areas indicate that the model may provide planners and policy makers with a powerful tool for evaluating the effects of policy alternatives on reservoir area development patterns and for forecasting the probable location of residential growth. (Settle-Wisconsin)
W72-14425

SOCIAL GOALS IDENTIFICATION: A SURVEY APPROACH,
Utah State Univ., Logan.
D. D. Bracken.
Available from the National Technical Information Service as PB-212 261, $3.00 in paper copy, $0.95 in microfiche. Master of Arts Thesis 1971. 142 p, 1 fig, 3 tab, 55 ref, 3 append. OWRR C-2194 (No 3383) (2).

Descriptors: *Water resources, *Planning, Water resources development, *Social values, Social aspects, *Surveys, Cost benefit analysis.
Identifiers: *Social goals, *Goal set, Social well-being, *Descriptive survey, *Open-ended question, *Semantic differential, *Demographic data, *Cross-tabulation, Microdata, Macrodata, Social reporting, Straw Man, *Environmental security.

The Office of Water Resources Research funded a regional, interdisciplinary project entitled 'Development of Techniques for Estimating the Benefits of Water Resources Development for Achieving National and Regional Social Goals.' The project under the direction of the Technical Committee of the Thirteen Western States Water Resources Research Institutes, had as its first-year objective the definition of national goals and the identification of techniques to measure social variables. The purpose of the research reported in this thesis was to evaluate the public's perception of social goals in an effort to validate the primary goal set (the Straw Man) identified by the Technical Committee. The technique employed to ascertain the completeness of this goal set was survey research utilizing Research Services, Inc., of Denver, Colorado to survey a 600 sample of the universe (Colorado). The results of the survey gave support to the expansion of the goal set to include environmental security. The data also shed light on the interviewed individuals' perceptions of the relative importance of activities in each goal area. The study indicates to the policy maker that the achievement of social goals through resource commitments will be relative to the population being considered.
W72-14428

SOCIAL IMPACT OF THE LIBBY DAM-LINCOLN COUNTY, THE CASE OF ABSENTEE OR EXTRA-LOCAL INFLUENCE,
Montana State Univ., Bozeman. Water Resources Research Center.
H. Tureck.
Available from the National Technical Information Service as PB-212 254, $3.00 in paper copy, $0.95 in microfiche. Montana Water Resources Research Institute, Bozeman, Completion Report No 29, (1972), 90 p. OWRR C-1443 (No 1984) (1).

Descriptors: *Social adjustment, *Social impact, *Social aspects, *Water resources development, *Social participation, Dam construction, *Montana, Rural sociology, Area redevelopment, Community development.
Identifiers: *Libby Dam (Mont), *Kootenai River (Mont).

The study of the impact of a large scale government project reveals that the question of adaptation is paramount. Whether or not the residents liked the dam on the Kootenai River was unconsequential, the dam came anyway and all that the residents could do was to adapt to it. How the residents adapt to that which they cannot control is important. Nestled in the mountains, isolated from urban areas or larger Montana towns, the illusion of self-determination presents itself. It is apparent that physical isolation does not necessarily produce the social isolation that allows for self-determination. Isolation can produce dialetical effects: freedom from outside control or determination by outside controlling forces. For all of its beauty and isolation from the hectic life of the urban centers, the area still is determined to a large extent by these urban centers. The coming of Libby Dam represents an example of this phenomenon. This study serves as an introduction and as a base for subsequent interpretative reports regarding the parameters of local community versus outside control, stability versus non-stability, and other factors that will establish the foundations for future development in this area. (Holje-Montana)
W72-14429

THE IMPORTANCE OF ECONOMIC FACTORS IN URBAN WATER SUPPLY SYSTEMS,
Water Resources Engineers, Inc., Springfield, Va.
G. K. Young, G. F. Tierney, and J. S. Selekof.
Available from the National Technical Information Service as PB-212 275, $3.00 in paper copy, $0.95 in microfiche. Completion Report 1-160, June 1972. 110 p, 23 fig, 30 tab, 75 ref, 2 append. OWRR - C-2139 (3404) (1).

Descriptors: Urban water supply, Economic, *Mathematical models, *Simulation analysis,

*Uncertainty, Water reuse, Recreation, Construction costs, Operation and maintenance, Hydrology, Stochastic processes, Demography, District of Columbia, Model studies, Human population, Water utilization.
Identifiers: *Washington (DC), Demography, Sensitivity, Economic.

The objective of this research is to determine the importance of economic factors on decisions relating to the planning of an urban surface water supply system. Economic factors include: ate of population growth, rate of industrial growth, water use rates, waste water reuse, recreation, costs of construction, operation and maintenance of facilities, interest rate, and costs of using alternative water supplies in the event of local water shortages. A case study involves the urban surface water supply system of the Washington, D.C. metropolitan area. This research centers around the use of a simulation model to determine the economic response of an urban surface water supply system to changes in economic factors and hydrologic data. The economic response of the system is determined through simulation using stochastic hydrology. The initial simulation is the reference response. Each subsequent simulation is preceded by a perturbation of one of the economic parameters about its central value. This procedure permits an analysis of the rate of change of the total economic response with respect to each economic parameter, and hence, the importance of each economic parameter. Variance estimates of economic data are developed and employed to determine the reliability of the results of the analysis. The study shows economic variability to be a major source of planning uncertainty. Demographic forecasts, in particular, are identified as major contributors to uncertainty.
W72-14430

URBANIZATION, WATER POLLUTION, AND PUBLIC POLICY,
Barnard Coll., New York.
For primary bibliographic entry see Field 05G.
W72-14437

REGIONAL WATER SUPPLY AND WASTEWATER DISPOSAL PLAN AND PROGRAM, CAPITAL DISTRICT REGION.
Male (C. T.) and Associates, Schenectady, N. Y.

Capital District Regional Planning Commission, Elnora, New York, CDRPC70-2-01, July 1971. 120 p, 16 fig, 15 tab, 60 ref. HUD N.Y.P. 212.

Descriptors: *Planning, *Waste water disposal, *Water supply, *Sewage treatment, New York, Regional analysis, Comprehensive planning, Urbanization, Hudson River, Sewerage, Coordination.
Identifiers: *Regional planning.

The population of the four-county region for which the Capital District Regional Planning Commission has responsibility is expected to grow from 720,000 (in 1970) to about one million by 1990. This will place an increased demand on the water supply and the sewage treatment systems in the area. Recommendations are presented to promote the health and living standards of the citizens and to encourage the orderly growth of the communities within the planning region. These include: interconnection of county water distribution systems without the construction of new water treatment facilities; construction of new and regional waste treatment plants, coordinated at the county level; and the placement of all treatment plants on major streams to preserve the water quality of the tributaries. The only drawback to county-level systems is that if construction costs rise above approved bids, the counties are required to obtain state approval to proceed. This can cause a significant delay of projects underway. It is recommended that the law be changed. (Poertner)
W72-14445

A WATER QUALITY MANAGEMENT STRATEGY FOR THE GREAT LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.
W72-14544

EVERGLADES-BIG CYPRESS NATIONAL RECREATION AREA.

Hearing on S.2465 Before the Subcomm. on Parks and Recreation of the Senate Comm. on Interior and Insular Affairs, 92nd Cong, 1st Sess, November 30, 1972. 234 p, 8 fig, 2 map, 1 photo.

Descriptors: *Legislation, *Water resources development, *Florida, *Land use, *Wildlife habitats, Water conservation, Water management (Applied), Recreation, Eminent domain, Water resources, Surface water, Groundwater resources, Aquifers, Recharge, Saline water intrusion, Federal government, Ecosystems, Water supply, Drainage, Estuaries, Water quality control, Conservation, Fish conservation, Parks, Watersheds (Basins).
Identifiers: *Everglades National Park.

The legislation concerns federal acquisition of land in the Big Cypress swamp area in the Everglades. Private developers have already commenced digging perimeter canals for the purpose of draining the land for development. According to testimony of scientists speaking in favor of the acquisition this drainage will cut off the flow of diffused water to the Everglades National Park causing it to dry up and become useless as a wildlife habitat. There are seventeen species of wildlife in danger of extinction in the area. The Governor of Florida, both Senators and several other public officials spoke in favor of the acquisition. Testifying against federal acquisition of the area were a number of landowners of the area in question who contended there were few valuable wildlife habitats in the area and that the Big Cypress Swamp furnished only about nine per cent of the water for the Park. A number of conservation groups testified in favor of federal acquisition noting also the danger of oil exploration and drilling in the area. Included in the Appendix are a number of technical reports on the wildlife, vegetation and water resources in the area. (Brackins-Florida)
W72-14556

GEOLOGIC HAZARDS AND LAND-USE PLANNING,
H. W. Peirce.
Fieldnotes from the Arizona Bureau of Mines, Vol. 2, No. 3, P. 1-7, 9 September 1972. 1 fig, 4 plates.

Descriptors: *Land use, *Arizona, *Hazards, *Flood plain zoning, *Legal aspects, Runoff, Water rights, Erosion, Zoning, Drainage area.
Identifiers: *Tucson Basin.

The Tucson metropolitan area occupies the Tucson Basin, a valley surrounded by mountain masses. An integrated network of surface drainage configurations include the Santa Cruz River, Pantano Wash, Tanque Verde Wash, and Rillito Creek, with numerous smaller washes transecting the Catalina Foothills which lie along the north boundary of the area under consideration. This mountain block has a potential to transfer large volumes of water to the valley below. This assessment of the Tucson geologic setting suggests that the most hazardous of the operating geologic processes is related to water movement along canyons, washes, rivers, and even city streets. With the growing urbanization of the Tucson Basin, 'hazardous' acreage will tend to be pressured into development. The responsibility for picking and choosing building sites is left to the discretion of individuals as laws regarding lowland development are apparently nonexistent. In the absence of protective zoning laws, it is essential that individuals become aware of the hazards that do exist, and that they can be minimized by proper sensitivity and selectivity. With much riverbottom and floodplain property privately held, overall management is complicated, with development leading to demands for protection after the problem is belatedly perceived. A series of photographs call attention to the various hazards identified. (Paylore-Arizona)
W72-14580

WASHINGTON STATE'S WATER,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 09A.
W72-14618

PLANNING OF REGIONAL WATER RESOURCE SYSTEMS FOR URBAN NEEDS,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06D.
W72-14638

SPACE-TIME ANALYSIS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W72-14643

MARSELLE-FOS: THE EQUIPMENT FOR A SEA SHORE; THE STABILITY TO PRESERVE, (MARSEILLE-FOS: L'EQUIPMENT D'UNE FACADE MARITIME; LES EQUILIBRES A PRE-SERVER),
Port Autonome de Marseille (France).
For primary bibliographic entry see Field 05G.
W72-14652

WATER QUALITY VERSUS RESIDENTIAL DEVELOPMENT: POLITICAL AND ADMINISTRATIVE ASPECTS OF WATER QUALITY MAINTENANCE IN PERRY AND CLINTON RESERVOIRS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 05G.
W72-14675

A STUDY OF THE COST AND EFFECTS OF IRRIGATION IN THE PLANNING AND IMPLEMENTATION OF THE LAJAS VALLEY AGRICULTURAL DEVELOPMENT PROGRAM,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
I. Aviles Cordero.
Available from the National Technical Information Service as PB-212 271, $3.00 in paper copy, $0.95 in microfiche. May 31, 72. 162 p. 4 maps, 32 tabs, 14 graphs. A-024-PR.

Descriptors: *Flood irrigation, *Furrow irrigation, *Gravity irrigation, *Irrigation systems, *Sprinkler irrigations, *Agriculture, *Development farms, *Farm ponds, *Irrigated land, *Irrigation canals, *Irrigation district, *Irrigation ditches, *Irrigation efficiency, *Irrigation water, *Irrigation practices, Water rights, Canals, Seepage, Arable land, Water requirements.
Identifiers: Rainfall frequency, Lajas Valley, Irrigation Costs, Agricultural Development Programme, Topography.

An attempt was made to investigate and analyze certain factors which, it was presumed were responsible for the high irrigation costs in agricultural development of the farms in the Lajas Val-

ley. The factors included were: (1) water available for irrigation; (2) topography of the farms; (3) types of soil; (4) irrigation methods employed; (5) administrative aspects of the system; (6) structural amenities of the farms; (7) maintenance of irrigation and drainage structures; (8) size of the agricultural unit; (9) land use and (10) handling of water in the farms. The study showed that among the factors investigated, the following are those which exercise the most significant influence on the costs of irrigation operations: (1) topography of the farms; (2) the administrative aspects of the system; (3) methods of irrigation employed and (4) size of the agricultural unit. The effectiveness of irrigation was proved by the fact that those farmers who irrigated obtained greater crop volume and that the total costs per ton of cane produced was much lower. As a result, the net benefit of the farm increased. Sugar cane should continue to be produced, because it produces a considerable income and can rely upon an assured market. Also, the heavy investments made by the Government and private farmers make it necessary a dynamic programming to achieve the efficiency and high production necessary to provide the farmers with the maximum profits.
W72-14678

DECISION ANALYSIS IN WATER RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
T. G. Roefs, and L. Duckstein.
Available from the National Technical Information Service as PB-212 368, $3.00 in paper copy, $0.95 in microfiche. Arizona Water Resources Research Center, Research Project Technical Completion Report, August 1972. 8 p, 9 ref. OWRR A-024-ARIZ (2).

Descriptors: *Planning, *Water allocation (Policy), *Pricing, *Decision making, Management, Streamflow, Groundwater, *Mathematical studies.
Identifiers: Collective utility, Streamflow synthesis, Transforms.

Collective utility calculus was applied to a water allocation and to a water pricing problem. Interrelationships between operating decisions and planning decisions for an idealized groundwater project were determined. A modification of the Corps of Engineers streamflow synthesis routine was made. (See also W72-02223)
W72-14845

THE PLANNING LAND-USE CONTROL RELATIONSHIP: A LOOK AT SOME ALTERNATIVES,
Illinois Univ., Urbana. Coll. of Law.
S. J. Plager.
Land-Use Controls Quarterly, Vol. 3, No. 1, p 26-32, Winter 1969. 16 ref.

Descriptors: *Planning, *Decision making, *Land use, *Control, Regulation, Zoning, Quality control, Long-term planning, Professional personnel, State governments.
Identifiers: *Policy making, *Input planning process, Regularization, Realistic perspective.

Two assumptions are made. (1) Governmental land-use controls must be based on some form of rational decision making process. (2) The functions of the urban planner and the planning professions are to play significant roles in that process. These assumptions are compared with historical and legal fact. Four alternatives are listed for structuring the planning-land-use control relationship: (1) authorization of zoning and other forms of land-use control without requiring formal planning, (2) to state the relationship in terms of directive statements, i.e., 'in accordance with a comprehensive plan', (3) to require specific planning procedures as a prerequisite to exercise of land-use controls, and (4) the input process. (1) and (2) are unacceptable methods. (3) is a substantial improvement over the no-plan and the directive statement alternatives. However, (3) emphasizes the plan rather than the planning process. It defines the contents of the plans in descriptive terms which provide no measure of quality or adequacy of the plans for the job to be done. The question of testing specific land-use decisions is untouched. The consequences of the input process (4) include: (1) long-range planning through governmental initiative, (2) employment of a full-time professional staff, (3) identification of decision makers, (4) regularization of governmental procedures, (5) the shifting of decision making to disinterested parties, (6) a more realistic perspective on the role of the planner, and (7) emergence of the state's role. (Strachan-Chicago)
W72-14881

THE RUN ON THE ENVIRONMENTAL BANK,
For primary bibliographic entry see Field 06G.
W72-14882

PROPOSALS FOR A NON-ESCAPIST NATIONAL URBAN GROWTH POLICY,
J. Carson.
City, Vol. 6, No. 1, p 62-63, January/February 1972.

Descriptors: *Planning, *Decision making, *Urbanization, City planning, Population, Distribution patterns, Land development, Control, Public lands, Tax rates.
Identifiers: *Policy making, *National urban growth policy, Escapist, Public participation.

Most discussion of a national urban growth policy tends to focus upon: (1) the limitation of population growth, or (2) the distribution of population and settlement. These approaches are seen as 'escapist'. An effective national urban growth policy must recognize that: (1) intervention is more effective if it channels rather than generates momentum, (2) opportunities for drastic intervention are limited, (3) the problems must be faced where they are, and (4) the public must participate actively in the urban development process. Five elements of such a national urban growth policy are proposed. (1) planning general distribution of urban land, (2) controlling urban development, (3) public ownership of urbanizing land, (4) a public urban development organization, and (5) changes in real estate tax. These suggestions put the action within the sphere of the metropolitan areas, and where it is needed. Urban development policy should focus on the development end of the process. (Strachan-Chicago)
W72-14885

THE PROFESSIONAL URBAN PLANNER,
Central Naugatuck Valley Regional Planning Agency, Waterbury, Conn.
D. A. Barr.
Journal of the American Institute of Planners, Vol. 38, No. 3, p 155-159, May 1972.

Descriptors: *City planning, *Comprehensive planning, *Decision making, Social aspects, Governments, Regulation, Limiting factors.
Identifiers: *Policy making, Government functionary.

The public image of the planner depicts him as an artist; as the master planner who intuitively prepares the best plans for the community. Planners, through their professional organizations, try to maintain an image of comprehensiveness. Neither image provides an adequate description of the planning profession. Neither explains why the plans prepared by the urban planner fail to gain real social commitment. What urban planners do and why they do it becomes more understandable when they are seen as governmental functionaires. A description of government's role, which is to order and regulate things, becomes a description of the planner's role. A description of the government to which the planner is subordinated can serve to define the practical limitations of the plans urban planners prepare. (Strachan-Chicago)
W72-14894

OUR RESOURCE ENDOWMENT AND OUTDOOR RECREATION,
Bureau of Outdoor Recreation, Denver, Colo. Mid-Continent Regional Office.
R. H. Sharp.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 155-162.

Descriptors: *Resources, *Recreation, *Management, Planning, Governments, Financing, Conservation.
Identifiers: Policy making, Public participation.

The evolution of the dynamics of outdoor recreation is discussed. The resources necessary for outdoor recreation experiences have alternative uses that should be fully understood and recognized. It is important that people become sensitive and conscious of the natural resources. The Bureau of Outdoor Recreation and its relationship to conservation are discussed. The objective of the Bureau is to assure that all Americans have the opportunity to enjoy the out-of-doors, and to assure a rich diversity of outdoor opportunities to enhance the quality of life. The Bureau is responsible for the Water Conservation Fund which financially assists states and local governments in meeting their outdoor recreational needs. It is engaged in special area studies. It provides technical assistance, comprehensive river basin planning, and individual water project planning. It has a responsibility to coordinate the total federal effort in outdoor recreation through a continuing analysis of federal policies and budgeted allocations. The Bureau views its efforts as an important contribution toward the awakening of the public consciousness to critical conservation needs. (Strachan-Chicago)
W72-14909

URBAN OPEN SPACE: PSYCHO-SOCIO AND LEGAL DIMENSIONS,
Colorado Open Space Foundation, Denver.
R. P. Hansen.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 209-220.

Descriptors: *City planning, *Psychological aspects, *Social aspects, *Legal aspects, Conservation, Ethics, Urbanization, Land development, Ecology, Engineering, Economics.
Identifiers: *Open space, Economic development philosophy.

One of the dramatic manifestations of an economic development philosophy measured in quantitative terms is the disruption, contraction, distortion, and destruction of open spaces in urban areas. Several basic errors have been made in the evaluations of open space for urban areas: (1) need for open space has been equated with 'little old ladies in tennis shoes', (2) open space has not been recognized when it was seen, (3) the role of undeveloped areas in the open space system of cities has not been recognized. The absence of open space in cities has assiduous results: delinquency, mental disturbance, and aggravated social and psychological problems. There are specific things to be done to preserve open spaces in metropolitan areas. (1) 'Open space' must be defined in broader, more comprehensive terms than are available under traditional 'parks and recreation' concepts. (2) A new and dynamic conservation must be instituted in the cities that will not merely tolerate, but will justify, for psychological, physiological,

social, and ethical reasons, an urban development that does not utterly destroy the natural environment. (3) Systems and procedures must be devised to effectively correlate ecological information with engineering expertise. Certain legal aspects of open space are also discussed. (Strachan-Chicago)
W72-14911

RECREATIONAL USE OF AN OKLAHOMA SCENIC RIVER BISECTED BY A FLOOD CONTROL-HYDROELECTRIC IMPOUNDMENT (REVISED),
Oklahoma Water Resources Research Inst., Stillwater.
R. C. Summerfelt, and A. K. Andrews.
Available from the National Technical Information Service as PB-212 383, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, 1972. 33 p, 8 tab. OWRR A-026-OKLA (1).

Descriptors: *Recreation, *Fishing, *Reservoirs, *Rivers, *Bass, *Economics, Value, Oklahoma.
Identifiers: *Mountain Fork River (Okla), Fishing man/day, Broken Bow Reservoir (Okla).

A recreation-use survey of a smallmouth bass-scenic river was conducted above and below Broken Bow Reservoir on the flowing portions of the Mountain Fork River, McCurtain County, Oklahoma from 1 August 1970 through 31 July 1971. Only those people actively using the river were interviewed to determine amount of use, aspects of fisherman harvest and economic value of the resource. A total of 16,542 people (8,408 above and 8,134 below) spent $88,133 ($45,188 above and $42,945 below) and caught 31,442 of 17 species of fish (26,457 above and 4,985 below) weighing 13,584 pounds (11,580 above and 2,003 below). People being interviewed stated a preference for the free flowing portions of the river as opposed to the regulated flows below the reservoir. An observed man-day of recreation above was worth $5.37 for a 1.9-hour trip with a man-day of 2.1 hours worth $5.28 below (total river value was $5.33 for a 2.0-hour day). Conversion of these values to the standard 5-hour man-day showed the value above to be $14.13, $12.87 below and $13.48 for total river. These values indicate a need to reevaluate the $3.00/man-day maximum amount allowed for a smallmouth bass fishery by federal law. Distribution of catch over time showed expected variation with few fish caught during the winter months and maximum catches occurring in the spring. Differences in catch above and below the reservoir were attributed to changes in the water quality below the reservoir.
W72-14917

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A COST ANALYSIS OF WASTE MANAGEMENT IN THE STEEL INDUSTRY,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05D.
W72-14379

MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM, WASTEWATER COLLECTION, TREATMENT AND DISPOSAL.
Humboldt County Planning Commission, Eureka, Calif.; and Baruth and Yoder, Walnut Creek, Calif.
For primary bibliographic entry see Field 05D.
W72-14380

EFFECT OF SIZE OF RESERVOIR ON HYDRO PROJECT COST,
National Technical Univ., Athens (Greece); and Public Power Corp., Athens (Greece).
M. S. Chandrakis.
Water, Vol. 24, No. 3, p 90-95, March 1972. 8 fig, 5 tab, 3 ref.

Descriptors: *Hydroelectric power, *Graphical analysis, *Annual costs, Peak loads, Electric power production.
Identifiers: Annual charges, Annual charges curve, Primary energy, Secondary energy.

A new graphical method is used to analyze the annual cost variation of a hydroelectric project following a change in the size of the storage reservoir. This original graphical technique is employed to derive a new curve, the annual charges curve, in which the production of secondary energy from the hydroelectric project is taken into account. The annual charges curve takes into consideration the possibility that a hydro project can produce both primary and secondary energy. Consequently, the annual charges curve may be used, without any reservations about the existence of secondary energy, as an equivalent to the curves for the thermal power stations. Furthermore, the disadvantage of showing the annual charges of a hydro station in relation to its produced energy during an average hydrological year is avoided when this new curve is used. In view of the fact that in most power economy studies it is necessary to know the change in the annual charges of power stations, the usefulness of this new analytical method appears significant. It contributes to a more correct evaluation of a hydroelectric station's ability to meet peak load demands. (Settle-Wisconsin)
W72-14419

EFFECTS OF POLLUTION CONTROL ON THE FIRM,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05G.
W72-14420

ECONOMICS OF HATCHERY SALMON DISPOSAL IN OREGON,
Oregon State Univ., Corvallis.
K. J. Roberts.
NOAA Commercial Fishing Publication, Marine Advisory Program, Sea Grant No 17. 20 p, 1 fig, 7 tab. (1972).

Descriptors: *Salmon, *Fish hatcheries, *Disposal, *Economic impact, Prices, Supply, Demand, *Oregon, *Waste disposal.
Identifiers: *Hatchery fish, Consumption.

Oregon's commercial fishermen frequently complain that the sale of returned hatchery salmon by Oregon's hatcheries adversely affects the fishing industry. Some poor quality hatchery salmon probably have been sold for human consumption. However, in 1971 the Fish Commission of Oregon began a grading program for the returned hatchery salmon that should prevent the sale of poor quality salmon for human consumption. Returned salmon are now judged to be (1) in excellent condition with no restrictions placed on their use, (2) in reasonably good condition but unfit to be sold as fresh or fresh frozen, and (3) in poor condition and restricted to use for non-human consumption. Also, the complaint that the sale of returned hatchery fish substantially lowers the market price for salmon seems to be unfounded. Between 1968 and 1971 the hatchery fish poundage used for human consumption was always less than 5 percent of commercial landings. Thus, it seems inaccurate to assume that this volume of hatchery fish could be responsible for lowering prices and that the other 95 percent of salmon marketed had no effect. The total effect of hatchery fish on prices is likely to be small. (Settle-Wisconsin)
W72-14423

PHOSPHATES, HEAVY METALS, AND DDT: POLLUTION CONTROL COSTS AND IMPLICATIONS,
For primary bibliographic entry see Field 05G.
W72-14424

A SURVEY OF ALTERNATE METHODS FOR COOLING CONDENSER DISCHARGE WATER--SYSTEM SELECTION, DESIGN, AND OPTIMIZATION.
Dynatech R/D Co., Cambridge, Mass.
For primary bibliographic entry see Field 05D.
W72-14724

UPPER COLORADO RIVER BASIN.
For primary bibliographic entry see Field 06E.
W72-14786

6D. Water Demand

A MATHEMATICAL-PROGRAMMING MODEL FOR PLANNING A REGIONAL WATER RESOURCE SYSTEM,
Water Resources Board of England and Wales.
For primary bibliographic entry see Field 06B.
W72-14242

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO (PART 1).
For primary bibliographic entry see Field 03F.
W72-14257

SIGNED DIGRAPHS AND THE GROWING DEMAND FOR ENERGY,
RAND Corp., Santa Monica, Calif.
F. S. Roberts.
Rand Report No. R-756-NSF, May 1971. 47 p, 6 fig, 25 ref.

Descriptors: *Graphical methods, *Energy, *Powerplants, *Mathematical models, *Demand, Air pollution, Solid wastes, Water pollution, Transportation, Employment, Algorithms, Forecasting, Graphical analysis, Population, *Electric power demand, Smog, Taxes, Tax rates, Environmental control, Water demand.
Identifiers: *Signed digraphs, *Energy demand, Energy consumption, Pulse processes, Policy problem.

Many of the problems of our complex, modern society, particularly those relating to energy use, air pollution, and solid waste disposal, seem amenable to formulation using the techniques of the rapidly growing field of graph theory, in particular the notion of a signed digraph. This report outlines a methodology which exploits the signed digraph for handling problems of forecasting energy demand and the effect of new technologies and institutions on that demand, and for generating and analyzing policy alternatives for modifying energy use to meet environmental constraints or standards. The forecasting and policy problems are translated into signed digraphs problems, and in particular to problems of so called pulse processes on signed digraphs. Research problems related to the development of the methodology are described. (Oleszkiewicz-Vanderbilt)
W72-14411

WATER CONSUMPTION STUDY FOR NAVAJO PLANT,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
For primary bibliographic entry see Field 05G.
W72-14413

REVISED WATER AND SEWER STUDY.
Bootheel Regional Planning Commission, Malden, Mo.

Available from the National Technical Information Service as PB-209 667, $3.75 in paper copy, $0.95 in microfiche. February 1972. 26 p, 2 tab. HUD Mo.P-195/SA/153.

Descriptors: *Water supply, *Sewerage, *Waste water treatment, *Water resources development, *Planning, Cities, Urbanization, Sewerage, Long-term planning, Federal project policy, Financing, Missouri, Administration, Regional analysis, Municipal water, Waste water disposal, Governments, Comprehensive planning, Local governments.
Identifiers: *Southeastern Missouri, Bootheel (Missouri).

This report provides the Department of Housing and Urban Development and local constituents with information concerning progress made in providing water and sewer services in the counties served by the Bootheel Regional Planning Commission (Dunklin, Mississippi, New Madrid, Pemiscot, Scott and Stoddard). An inventory is presented of existing local comprehensive plans, local municipal water and sewer plans, individual county water and sewer plans, and a four-county regional water and sewer plan. Progress the municipalities have made in improving and seeking federal financial assistance as an aid in providing the recommended water and sewer services to their respective citizens is discussed. A priority ranking is given of proposed needed water and sewer improvements based upon the date that a project received its A-95 review. This priority ranking of projects may be added to or changed based upon the number of applicants recieved. All projects are reviewed and the commission's recommendations are governed by the projects conformance to a plan. (Poertner)
W72-14442

MASTER WATER PLAN FOR STOCKTON--EAST WATER DISTRICT, IN COOPERATION WITH CITY OF STOCKTON, SAN JOAQUIN COUNTY CALIFORNIA WATER SERVICE COMPANY.
Stoddard and Associates, Los Banos, Calif.

February 1972. 146 p, 12 fig, 15 tab, 31 ref.

Descriptors: *Water supply, *Planning, *Water sources, *Water demand, *California, Saline water intrusion, Comprehensive planning, Imported water, Urbanization, Groundwater availability, Irrigation water, Water table.
Identifiers: Stockton (Calif), San Joaquin County (Calif).

The growth of the Stockton-East Water District will result in additional, unsatisfied demands of 39,000 acre-feet in 1980 and 144,000 acre-feet by 2020. The present use of ground water supplies has led to an extensive cone of depression and, as a result, saline water intrusion has occurred. The Stockton and East San Joaquin Water Conservation District should contract promptly for an additional surface supply of water from the Folsom South Canal of 79,000 acre-feet per year, and they should begin to utilize a portion of this supply as soon as the Folsom South Canal is capable of making deliveries to the District. Any delay in acquiring the initial deliveries of the additional surface supply will prolong the existence of the cone of depression and thereby increase the extent of intrusion of saline water into the ground water underlying the District. All other supplies of water from the Calaveras River and the New Hogan Project should be utilized. Recommendations are given for obtaining additional water supplies for other water supply problems in the area. (Poertner)
W72-14446

COMPREHENSIVE WATER AND SEWERAGE STUDY.
San Joaquin County Advisory Planning Association, Stockton, Calif.

For primary bibliographic entry see Field 06A.
W72-14447

A COMPREHENSIVE PLAN FOR WATER-WORKS AND SANITARY SEWERAGE FACILITIES, RIDGELAND, MISSISSIPPI.
Dawson Engineers, Inc., Jackson, Miss.

Available from the National Technical Information Service as PB-208 897, $3.00 in paper copy, $0.95 in microfiche. Town of Ridgeland, Mississippi and the Ridgeland Planning Commission, July 1971. 77 p, 5 fig, 6 tab, Mississippi P-91.

Descriptors: *Water supply, *Sewerage, *Local governments, *Water resources development, *Long-term planning, Construction costs, Capital costs, Comprehensive planning, Cities, Urbanization, Mississippi, Municipal water, Waste water disposal.
Identifiers: *Ridgeland (Miss).

The plans are intended to serve as guidelines for the Town of Ridgeland and the Ridgeland Planning Commission for the period of 1971 to 1990. The recommended plans were developed from the most suitable alternate plans considered, based on immediate and long-range needs, economy, practicality, and compatibility with existing facilities and trends in land development. Preliminary engineering design of facilities has included studies of the most feasible means of developing water supply and providing a sewerage system. The recommended water plan proposes that two intermediate systems be established in the eastern and western portions of the Planning Area. The western portion, being the Ridgeland Municipal System, would be improved and expanded initially within the economic capability of the community. The eastern portion, being the Pearl River Valley Supply District, Tavern Hill area, and the Natchez Trace Village area would combine to form a single district under one authority. These systems would assume supply, treatment (if required), and distribution functions within each separate area. The estimated sewage flows for the Planning Area are given. The concept of initial limited decentralized and ultimate centralized systems are applicable to the planning of sewerage systems as well as water systems. The development of two systems initially offers the advantage of providing sewerage facilities to a majority of residents in the Planning Area. The ultimate centralized concept invisions a single system easily adapted to a comprehensive long-range solution to water pollution problems. (Poertner)
W72-14450

PLANNING OF REGIONAL WATER RESOURCE SYSTEMS FOR URBAN NEEDS,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
D. H. Moreau.
Completion Report, March 30, 1972. 3 p. OWRR B-021-NC (1).

Descriptors: *Urban hydrology, *Planning, *Water demand, *Water supply, *Regional development, *River basins, *North Carolina, Water resources, Land resources, Sewers, Streamflow, Optimization, Simulation analysis.
Identifiers: *Piedmont.

A comprehensive study was undertaken to examine modifications to existing planning and analytical models that are necessary for the development of limited water and related land resources to serve the needs of several emerging urban areas within a region that spans several river basins in the Piedmont of North Carolina. Three basic tasks were set forth in the proposed research plan: (1) To identify emerging needs for water and related lands within the region; (2) to examine a limited set of alternative programs for development and management of a regional system; and (3) to examine adaptations of water resource planning to a new institutional framework and its relationships to state and federal activities. The newly established institutional arrangement assigned to multi-county planning districts the responsibility to develop regional water and sewer plans in compliance with guidelines set forth by the Environmental Protection Agency and the Department of Housing and Urban Development. Project No. B-021-NC presents writings based upon the two-year study's first year of research. A completion of the project is found in B-45-NC. In keeping with the proposed plan, individual research papers in the project present supply-demand relationships, monthly streamflow models, a water quality model, a simulation model, and others. (See also W72-14639 thru W72-14641) (Bell-Cornell)
W72-14638

RELATIONSHIPS BETWEEN SUPPLIES AND PROJECTED DEMANDS FOR WATER IN A SIX-COUNTY URBANIZING REGION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
D. H. Moreau.
(1972). 13 p, 2 fig, 6 tab, 10 ref.

Descriptors: *North Carolina, *Urban hydrology, *Water demand, *Water supply, *Water quality, *Regions, *River basins, *Human population, *Economic prediction, Municipal water, Industrial water, Estimating, Biological treatment.
Identifiers: *Supply-demand relationships, *Piedmont, *Water use, Winston-Salem, High Point, Chapel Hill, Greensboro, Burlington, Durham, Raleigh, Cape Fear River basin, Neuse River basin, Yadkin River basin, Roanoke River basin.

Considerable insight into the magnitudes of future regional water demands can be gained by examining projected population levels together with anticipated changes in economic activities that tend to alter water use rates. Such examination is made of a linear six-county region in North Carolina, containing four river basins and seven cities. The locations of these cities with respect to basin boundaries, and with respect to each other, place intense demands for water supply and waste disposal on the small streams on which they are situated. Serious water quality problems are recurrent even with exceptionally high levels of biological treatment of domestic and industrial wastes. Limitations on quantities of water available have already deprived the area of several otherwise desirable wet process industries, a situation that will be further aggravated as growth continues to occur. Examination results indicate a possible 64% increase in population by the year 2000. After approximating current demands for municipal and industrial water supplies and surveying the regional economic trends, it is assumed that percapita use rates and resulting total water demands for the year 2000 will increase by 90%. Oxygen demands on streams are expected to grow in direct proportion to the population. (See W72-14638) (Bell-Cornell)
W72-14639

UTILIZATION OF AN INPUT-OUTPUT MODEL FOR PREDICTING WATER DEMAND ON A SMALL WATERSHED,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 06A.
W72-14644

THE MEASUREMENT OF THE DEMAND FOR IRRIGATION WATER WITH SPECIAL REFERENCE TO SOUTHWEST KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 03F.
W72-14677

PRELIMINARY STUDIES ON GROUNDWATER IN SAMARATIKRIT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 04B.
W72-14872

6E. Water Law and Institutions

INTERGOVERNMENTAL RELATIONS IN WATER RESOURCES ACTIVITIES.
Wendell and Schwann, Washington, D.C.

Available from NTIS, Springfield, Va. 22151, as PB-210 358 for $12.50 paper copy. National Water Commission Report no. SBS 72-049, Sept. 1972, 630 p, append.

Descriptors: *Water resources development, *Water policy, *Institutions, *Organizations, *Coordination, *Decision making, Financing, Regulation, Planning, Manpower, Water law, Governments, Interagency cooperation, Interstate compacts, Water Resources Planning Act.
Identifiers: *Intergovernmental relations, *Institutional arrangements, *Environmental institutions.

Intergovernmental arrangements for public water activities are examined within their historical context in the first half of the report. These arrangements are classified in terms of nine tools which Federal, state and/or local units of government use to secure water resources actions by the other levels of government. The tools are financial incentives, regulation, intergovernmental planning, technical assistance, manpower training, project development, comprehensive management, legal rights to water, and development and dissemination of information. The second half of the report analyzes the characteristics, uses and effectiveness of each of the nine tools, both singly and in combination. The efficacy of interagency committees, interstate and Federal interstate compacts, the Water Resources Planning Act and other intergovernmental mechanisms is assessed. Arrangements for improved environmental quality and solution to metropolitan problems are given particular emphasis, with a chapter devoted to environmental institutions. On the basis of its analysis, the report makes recommendations for changes in the nine tools and the institutions on which they operate. (NWC)
W72-14238

HEARINGS--PUBLIC WORKS FOR WATER, POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATIONS FOR FISCAL YEAR 1973--PARTS 1-5.
For primary bibliographic entry see Field 05G.
W72-14251

POWERPLANT SITING AND ENVIRONMENTAL PROTECTION, PART 2.
For primary bibliographic entry see Field 06G.
W72-14252

GATEWAY AREA PROPOSALS.
For primary bibliographic entry see Field 06G.
W72-14253

SEWAGE-POLLUTION PREVENTION.
For primary bibliographic entry see Field 05D.
W72-14254

VERMONT WHEY POLLUTION ABATEMENT AUTHORITY LAW.
For primary bibliographic entry see Field 05G.
W72-14255

ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING, AND MANAGING WATER RESOURCES IN AGRICULTURE.
Economic Research Service, Madison, Wis.
For primary bibliographic entry see Field 03F.
W72-14256

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO (PART 1).
For primary bibliographic entry see Field 03F.
W72-14257

INTRODUCTION OF A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.

Senate Bill 4105, 91st Cong, 2d Sess (1970). 2 p.

Descriptors: *Federal Water Pollution Control Act, *Grants, *Municipal wastes, *Treatment facilities, Sewage, Sewage treatment, Water pollution, Water pollution control, Pollution abatement, Legal aspects, Water law, Government finance, Federal government, Waste disposal, Sewage disposal, Storm drains, Water quality, Water quality control, Legislation.

Two major amendments in the Federal Water Pollution Control Act are proposed by S.4105. The first is an amendment to section eight, subsection (f), which would authorize a special twenty per cent incentive grant for new construction of pollution abatement works by municipalities which have built sewage projects since 1956 which were qualified for federal assistance at the time they were built but were not in fact aided by the authorized thirty per cent federal grant. The total of these incentive grants would be limited to the total amounts of federal grants by which sueh municipalities were shorted since 1956. These municipalities failed to receive any grants because of a lack of full funding and a dollar ceiling imposed on all project grants. The second change is an amendment to subsection (c) of section twenty-three which would permit federal funding of projects directed toward the solution of the combined sanitary and storm sewer problem. Recent research indicates that large metropolitan complexes are not receiving a proportionate share of federal funding for waste treatment works. (Brackins-Florida)
W72-14258

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS (DIGEST OF BILL).
Senate Bill 2770, 92d Cong, 1st Sess, Digest of General Bills and Resolutions (1971). 5 p.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Water pollution control, *Water quality standards, Water pollution, Water quality, Water quality control, Legal aspects, Water law, Watercourses (Legal aspects), Administrative agencies, Federal government, State governments, Governmental interrelations, Industrial wastes, Municipal wastes, Sewage effluents, Government finance, Federal budget permits, Treatment facilities.
Identifiers: Citizen suits, Injunctions (Prohibitory).

Amendments to the Federal Water Pollution Control Act establish a policy that discharges of pollutants should be eliminated by 1985 and for restoration of natural water integrity by 1976. The bill also provides for expanded Environmental Protection Agency (EPA) participation in research programs and water treatment demonstration projects; provides for research into preventing agricultural runoff pollution, and appropriates funds, inter-agency grants, and scholarships. Federal financing for construction of treatment works is increased to sixty percent of the total cost. The federal share shall be increased to seventy per cent if the state contributes ten per cent. Provisions are included for establishment of water quality standards and enforcement and for publishing effluent guidelines. A permit program for the discharge of pollutants into navigable waters and beyond is also included. This program would replace the Refuse Act Permit Program. However, an approved state permit program may be approved in place of the federal program. The bill also empowers the EPA to take remedial action against pollution which presents an imminent danger to health, provides for expanded civil remedies by private citizens, provides for notice of such suits to the EPA, and provides for state suits and standards. (Brackins-Florida)
W72-14259

EFFECTIVE POLLUTION CONTROL IN INDUSTRIALIZED COUNTRIES: INTERNATIONAL ECONOMIC DISINCENTIVES, POLICY RESPONSES, AND THE GATT,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 05G.
W72-14426

SOCIAL GOALS IDENTIFICATION: A SURVEY APPROACH,
Utah State Univ., Logan.
For primary bibliographic entry see Field 06B.
W72-14428

WATER RESOURCES ADMINISTRATION IN MINNESOTA - 1972,
Minnesota Univ., Minneapolis. Water Resources Research Center.
W. C. Walton.
Available from the National Technical Information Service as PB-212 277, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, Bulletin 49, April 1972. 188 p, 15 ref. OWRR A-021-Minn (4).

Descriptors: *State government, *Legislation, *Water policies, *Administration, Budgeting, Programs, Coordination, Institutions, Minnesota, Organizations, Water law, Water districts, Political aspects, Environment, Water resources, Federal government, Interest groups, Lobbying, Attitudes, Resource agencies, Issues, Ecology.
Identifiers: *State governmental reorganization, *Legislative process, *State environmental policy, Federal governmental reorganization, Citizen participation, Viewpoints, Associations.

In 1970, Minnesota's State government contained at least 21 departments, agencies, boards, commissions, committees, etc. with water and related land resources responsibilities. Expenditures by these organizations increased from $5.7 million in 1950 to $31.9 million in 1970. About 86% of expenditures were made by the Department of Conservation. Total State agency staff complements increased from 1,100 in 1960 to 1,400 in 1970. Prime responsibility for water and related land resources programs rested in 3 Committees of the Senate and 2 Committees in the House. The Governor's and Legislature's control of the State's administrative apparatus is hampered through fragmented organization. In 1970, there were 5 International, 5 regional, 3 interstate, and 4 Federal-State organizations with programs in the State. Federal responsibilities in water and related land resources plannin pumping, rehabilitation of a small flowage, urban runoff, characterization private controls for recreational land development, shoreland development, and lake rehabilitation legislation and programs. The progress of Minnesota's shoreland program and activities in lake demonstration projects was described. Alum was used successfully for chemical inactivation of nutrients in an overfertilized small lake in WISCONSIN. Dilutional pumping resulted in some success in reducing the phosphorus content of another lake. Plastic sheeting, in combination with sand and gravel blankets

on the bed of a millpond, was used to control aquatic plants. With regard to water-oriented recreational developments, it was suggested that an automatic property owners association can provide a mechanism for maintaining and managing the common open space and facilities to which individual lake lot owners have common rights. A nation-wide survey disclosed that explicit statutes saying that a local unit of givernment or State agency is authorized to project, manage, or rehabilitate lakes are rare. (Walton-Minnesota)
W72-14438

THE TEXAS WATER QUALITY ACT.
Texas Water Quality Board, Austin.

Agency Publication Number 72-02, February 1972. 90 p.

Descriptors: *Legislation, *Texas, *Legal aspects, *Water law, *Water quality standards, Water pollution control, Governments, Water quality.

In order to familiarize the public with changes in the Texas water laws, the Texas Water Quality Board prepared this extract of the changes. The nine subchapters are: (1) general provisions; (2) administrative provisions; (3) powers and duties of the Texas Water Quality Board; (4) regulations applying to regional systems; (5) provisions for the enforcement of these laws; (6) the defining of the authority of local governments; (7) provisions for judicial review; (8) regulations regarding criminal prosecution; and (9) rules concerning financial assistance for waste treatment construction. In most cases the revisions are of form, but there are instances of alteration and deletion of prior statutes. (Poertner)
W72-14443

WATER SUPPLY MANAGEMENT STUDY FOR THE SOUTHEASTERN CONNECTICUT REGIONAL PLANNING AGENCY.
Peat, Marwick, Mitchell and Co., Hartford, Conn.

Available from the National Technical Information Service as PB-208 671, $3.00 in paper copy, $0.95 in microfiche. Southeastern Connecticut Regional Planning Agency,, Norwich, December 1971. 55 p, 4 fig, 1 tab. HUD CPA-CT-01-26-1011.

Descriptors: *Administration, *Administrative agencies, *Planning, *Water supply, *Water resources development, Connecticut, Water supply development, Municipal water, Cities, Regional analysis, Urbanization, Legislation, Optimum development plans, Feasibility studies, Financial feasibility.
Identifiers: *Southeastern Connecticut.

The Southeastern Connecticut Water Authority is evaluated from a management standpoint. Particular emphasis is placed on organizational and financial requirements for an effective regional service agency. Proposals for short-range improvements to the present Water Authority are made. From a long-range management standpoint Southeastern Connecticut should move toward the creation of a multi-purpose regional agency concerned with planning, water supply, waste water disposal, air pollution control, and recreation. An Ad Hoc Advisory Regional Organization Committee of about 15 members should be established. The Committee would have responsibility for taking steps needed to secure appropriate legislation for establishing a new Southeastern Connecticut Regional Agency. Public hearings are recommended for consideration of the proposed plan for establishing the Agency. (Poertner)
W72-14449

PRIVATE COMPENSATION FOR INJURIES SUSTAINED BY THE DISCHARGE OF OIL FROM VESSELS ON THE NAVIGABLE WATERS OF THE UNITED STATES,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 05G.
W72-14545

THE ECE SYMPOSIUM ON PROBLEMS RELATING TO ENVIRONMENT,
Woodrow Wilson International Center for Scholars, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14546

SCL SPONSORED 'EXCURSION' INTO FORESTRY, ECOLOGY, AND NATURAL RESOURCES IN SOUTH CAROLINA,
House, Washington, D.C.
T. S. Gettys.
Congressional Record, Vol 118, No 79, E5284-E5288 (daily ed), May 16, 1972. 5 p.

Descriptors: *South Carolina, *Forest management, *Ecology, *Forestry, Natural resources, Recycling, Resources development, Administrative agencies, Comprehensive planning, Air pollution, Water pollution, Land use, Trees, Lumbering, Water quality control, Recreation, Recreation demand, Clear-cutting, Forest fires, Planting management, Reforestation.

The Hon. Tom S. Gettys of South Carolina speaks in the U.S. Congress of a Seaboard Coast Line sponsored excursion in forestry, ecology, and natural resources in South Carolina. Mr. Gettys discusses the nature and scope of this presentation, which included remarks by the Hon. William E. Gailbraith, Deputy Under Secretary of Agriculture, on South Carolina's forest resources and the need for more enlightened harvesting techniques. Mr. James C. Hair, president and general manager of Bowaters Carolina Corp. comments on what only one industry, the forest products, is doing to improve the quality of our environment. These efforts include the National Council of the Paper Industry for Air and Stream Improvement, which is totally dedicated to research to improve air and water quality, and massive reforestation efforts, clearcutting, wilderness preservation, and recycling. Also discussed is the controversy over whether undeveloped wilderness areas should be developed for recreation and managed or whether more forests should be allowed to remain as permanent wilderness. (Widman-Florida)
W72-14547

JETPORT: PLANNING AND POLITICS IN THE BIG CYPRESS SWAMP,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 06G.
W72-14548

THE DEEP SEABED HARD MINERAL RESOURCES BILL,
Auckland Univ. (New Zealand).
F. M. Auburn.
San Diego Law Review, Vol 9, No 3, p 491-513, 1972. 133 ref.

Descriptors: *Law of the sea, *Beds, *Mineral industry, *Legislation, *Oceans, Legal aspects, Legal review, International law, Expolitation, Exploration, Ships, Mining, Ownership of beds, Manganese, Permits, Boundaries (Property), Continental shelf, Social aspects, Political aspects, United Nations, Federal jurisdiction, United States, Economic impact.

Provisions are analyzed of the Deep Seabed Hard Mineral Resources Bill which was drafted by the American Mining Congress. There is currently no international mechanism for controlling deep sea mining beyond the continental shelf except an international moratorium, which the United States does not consider binding. The bill would permit the Department of Interior to license deep sea hard mining by persons and juridical entities subject to United States jurisdiction. International legal problems involved with the bill are discussed including the related problem of defining the limit of the continental shelf and the territorial sea, control of exploitation of the seabed on the traditional high seas, classification of minerals such as petroleum and minerals suspended in water, nonuniform provisions dealing with reciprocating states, inadequate licensing requirements, liability provisions, conflicts of federal agency jurisdiction, and investment protection. The bill is strictly 'municipal' legislation that does not consider the need for resolving international conflict nor the need for protecting the common heritage of the deep sea. (Grant-Florida)
W72-14549

OIL POLLUTION PROBLEMS ARISING OUT OF EXPLOITATION OF THE CONTINENTAL SHELF: THE SANTA BARBARA DISASTER,
For primary bibliographic entry see Field 05G.
W72-14550

EXEMPTIONS FROM NEPA REQUIREMENTS SOUGHT FOR NUCLEAR PLANTS, POLLUTION PERMITS,
C. E. Barfield.
National Journal, Vol 4, p 1025-1034, June 17, 1972. 1 photo.

Descriptors: *Legal review, *Electric powerplants, *Water permits, *Water pollution, Water pollution sources, Administrative agencies, Adoption of practices, Environmental effects, Political aspects, Legal aspects, Political constraints, Regulation, Judicial decisions, Legislation, Rivers and Harbors Act, Federal jurisdiction, Water law, Nuclear powerplants.
Identifiers: *National Environmental Policy Act, *Environmental Impact Statements.

Recent court decisions construing the National Environmental Policy Act (NEPA) and the effect that they have had in encouraging attempts to amend NEPA are examined. Two problems are the cause of these efforts: the shortage of electricity and the ability to avert it by ignoring some of NEPA's procedural safeguards, and delays in implementing NEPA's permit program due to required impact statements. Court decisions have strictly construed NEPA's impact statement requirement and also the permit requirement of the Refuse Act. Several bills which would relieve the situation by dispensing with the needed impact statements are reviewed. The arguments of industry and environmental groups with respect to each bill is summarized as is the position of the Nixon administration, which generally is favorable to the proposed amendments. Measures proposed by the bills include the following: suspension of the impact statement requirement for issuance of discharge permits, interim authority to operate nuclear power plants, expedited procedures for power plant siting decisions, exemption from procedures by Presidential declaration of an emergency, and exceptions to the need for impact statements for certain types of projects. (Grant-Florida)
W72-14551

MARINE ARCHAEOLOGY AND INTERNATIONAL LAW: BACKGROUND AND SOME SUGGESTIONS,
H. H. Shore.
San Diego Law Review, Vol 9, No 3, p 668-700, 1972. 116 ref.

Descriptors: *Law of the sea, *International law, *Archaeology, *Marine geology, *Beds, Continental shelf, Legal review, Legal aspects, Oceans,

Governments, Jurisdiction, International Joint Commission, Coasts, Coastal areas, Shores, United States, United Nations, Exploration.
Identifiers: *Marine archaeology.

Some of the current legal problems confronting marine archaeology are analyzed including the right to explore and excavate. Current United Nations guidelines and the European Convention on the Protection of the Archaeological Heritage are discussed. The problems presented by current definitions of territorial sovereignty and rights in adjacent waters and seabed areas are examined. The purposes of state sovereignty over coastal waters are discussed. Archaeological research differs from state sovereignty interests since the research has no distinct commercial or military objective and does not infringe the security of other nations nor give an unfair advantage in the exploitation of resources. Suggestions for international principles governing marine archaeology include an international commission, special consideration for certain organizations, control beyond state jurisdiction, and regional commissions. The current state of property rights in archaeological finds is examined. Ownership should not automatically belong to the state in which the find is located. Included are suggestions for international principles governing property rights of finds within and without coastal state jurisdiction. It is recommended that modern marine archaeology be made an agenda item at the next United Nations Conference on the Law of the Sea. (Grant-Florida)
W72-14552

THE PROBLEMS OF DELIMITATIONS OF BASE LINES FOR OUTLYING ARCHIPELAGOS,
M. A. Leversen.
San Diego Law Review, Vol 9, No 3, p 733-746, 1972. 38 ref.

Descriptors: *Islands, *International law, *Atolls, *International waters, Oceans, Law of the sea, Treaties, Commercial fishing, Foreign waters, Legal aspects, Boundary disputes, Legal review, United States, International commissions, United Nations.
Identifiers: *Archipelagos, *Territorial sea.

A major problem of international law is defining the extent of the territorial sea and contiguous zone of a nation-state archipelago. The conflicting views of freedom of the seas and an island's need for exploiting the sea are discussed. Most archipelagos claim sovereignty over all waters inside a straight base line drawn around all islands in the group. This presents problems where islands are several hundred miles apart. Some proposed solutions are discussed including use of a straight base-line method where islands are within certain maximum distances of each other, use of a straight base-line following the coast, and use of the low-water line along the coast as the normal base line for the territorial sea. However, none of the proposals deal satisfactorily with the diverse characteristics of archipelagos. Some combination is needed such as using the base-line method to define the contiguous zone and the low-water line to define the territorial sea. (Grant-Florida)
W72-14553

WATER POLLUTION--PENALTY.

Maine Public Laws ch. 458 (1971).

Descriptors: *Maine, *Legislation, *Solid wastes, *Oil pollution, Legal aspects, Water law, Oil spills, Oil, State governments, Regulation, Water pollution, Water pollution control, Water quality, Water quality control, Industrial wastes, Potatoes, Wood wastes, Penalties (Legal), Waste disposal.

The act provides that no legal entity shall discharge or permit the discharge of oil into the inland waters of Maine. Anyone who does discharge oil into the waters shall report the fact of such discharge to the commission and undertake to remove such discharge to the commission's satisfaction. A failure to report a discharge of oil shall be subject to a fine between $500 and $1,000. Other proscribed discharges, whether direct or indirect, include forest products refuse, including any slabs, edgings, sawdust, shavings, chips, or bark; potatoes, and refuse, including scrap metal, junk, paper, garbage, septic tank sludge, rubbish, old automobiles or similar refuse. Violation of the discharge section is punishable by a fine of not less than $100 nor more than $500. (Brackins-Florida)
W72-14554

FISCAL YEAR 1973 AUTHORIZATION OF APPROPRIATIONS FOR THE FEDERAL SALINE WATER CONVERSION PROGRAM.
Hearing on S. 3097--Subcomm. on Water and Power Resources--Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, March 9, 1972. 29 p.

Descriptors: *Legislation, *Desalination, *Government finance, Desalination apparatus, Administrative agencies, Long-term planning, Financial analysis, Desalination processes, Publications, Federal government, Water resources development, Legal aspects, Saline water, Environmental effects, Thermal pollution, Water pollution sources.

Testimony is included on S.3097 authorizing appropriations for the saline water conversion program for fiscal year 1973. Current areas of development discussed include desalination, prototype plants, desalination of geothermal brines, the San Diego test facility, and reverse osmosis test beds. The specific areas in which an increase in funds is needed are discussed. The bill also contemplates deletion of section 6 (d) of the Saline Water Conversion Act of 1971 concerning availability of information and patents resulting from research under the Act. The effect of deleting this provision would be to bring patents and distribution of information under general federal policy. Included in the hearing is the statement of J. W. O'Meara, Director of the Office of Saline Water of the Department of the Interior. Recent prototype and laboratory tests with desalination and the associated environmental effects of such an operation are also described. (Waldron-Florida)
W72-14555

INTERNATIONAL COOPERATION IN THE HUMAN ENVIRONMENT THROUGH THE UNITED NATIONS.
Hearings on H.R. 13116--Subcomm. on International Organizations and Movements--Comm. on Foreign Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, March 15 and 16, 1972. 101 p.

Descriptors: *Environmental control, *Legislation, *International law, *United Nations, *Water pollution control, Long-term planning, Governments, Law of the sea, Foreign countries, Aquatic environment, Oceans, Atmospheric pollution, Pollution abatement, Federal government, Political constraints, Conferences, International joint commission.
Identifiers: *U.N. Conference on the Human Environment.

The hearings centered around H.R. 13116, proposed by Congressman Seymour Halpern. This proposed legislation is described by its author as a bill to promote international cooperation in United Nations efforts to protect the world's oceans and atmosphere. The aim of the bill is to encourage an international accord on pollution abatement standards and enforcement mechanisms. Testimony and discussion concerns the political and economic advisability of unilateral pollution abatement by the United States when considering the high cost of industrial pollution abatement. The State Department position is that the proposed legislation would interfere with initiatives which the executive branch has already placed in motion. The second subject considered by the subcommittee concerns the United States' role at the upcoming U.N. Conference on Human Environment. The testimony considers such questions as: how the United States policy has been formulated thus far; who is making the major inputs to that policy; how the work of the preparatory committee of the U.N. is progressing; what the policies of other major nations are; what problems have been encountered concerning conference participation by some nations; and what contributions can be made by Congress and the public toward a constructive United States role at the Conference. (Waldron-Florida)
W72-14557

CATTLE FEEDERS MUST COMPLY WITH ANTI-POLLUTION LAWS,
R. Reiman.
The Cattleman, Vol. 58, No. 2, p. 43, 58, July 1971.

Descriptors: *Legal aspects, *Pollution abatement, *Agricultural runoff, *Return flow, *Waste disposal, Cattle, Permits, Discharge (Water), Animal wastes (Wildlife), Feedlots, Texas, New Mexico, Oklahoma, Irrigation water, Pollutants, Surface waters, Water pollution control, Sediment discharge, Erosion, Salinity, Fertilizers, Pesticides, Water quality control, Taxes.

Current federal anti-pollution laws for cattle feeders are reviewed. The Environmental Protection Agency (EPA) now requires that a permit be obtained from the Army Corps of Engineers before any discharges or deposits can be made into a navigable stream. The ruling applies to feedlots with more than 1,000 animal units and all new feedlots. It applies to at least 306 lots in Texas, 45 in New Mexico and 48 in Oklahoma. It is estimated that 10,000 beef cattle on a feedlot produce 200 tons of daily waste, comparable to a 100,000 to 200,000-person city. Agricultural runoff, irrigation return flow and confined feeding operations concern the EPA. The greatest quantity of pollutants in the surface waters of the country is sediment caused by erosion. Increased salinity concentration in receiving waters is a problem, especially when coupled with fertilizers and pesticides. Management of polluted waters is a growing research area. Some practices qualify for tax breaks. (Popkin-Arizona)
W72-14579

GEOLOGIC HAZARDS AND LAND-USE PLANNING,
For primary bibliographic entry see Field 06B.
W72-14580

A CURRENT PROBLEM IN THE ENVIRONMENTAL CRISIS, MERCURY POLLUTION, AND ITS LEGAL IMPLICATIONS,
Washington Univ., St. Louis, Mo. Center for Biology of Natural Systems.
For primary bibliographic entry see Field 06G.
W72-14631

WATER QUALITY VERSUS RESIDENTIAL DEVELOPMENT: POLITICAL AND ADMINISTRATIVE ASPECTS OF WATER QUALITY MAINTENANCE IN PERRY AND CLINTON RESERVOIRS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 05G.
W72-14675

ILLINOIS LAWS RELATING TO WATERWAYS, 1971.
Illinois State Div. of Waterways, Springfield, Ill.
For primary bibliographic entry see Field 04A.
W72-14752

POLLUTION CONTROL IN INDIANA,
House, Washington, D.C.
L. H. Hamilton.
Congressional Record, Vol 118, p E5633-E5634 (daily ed.) May 23, 1972. 2 p.

Descriptors: *Indiana, *Water pollution control, *Administration, *Pollution abatement, Costs, State governments, Regulation, Municipal wastes, Sewage, Sewage effluents, Industrial wastes, Water pollution, Water pollution control, Local governments, Governmental interrelations, Water quality standards, Financing, Budgeting, Government finance, Water law, Law enforcement, Legal aspects, Water quality control, Administrative agencies, Waste treatment.

Administration of water pollution control programs and construction of control facilities in Indiana are funded separately. The State General Assembly increased the manpower on the Stream Pollution Control Board. Still, personnel on the Board believe the staff should be increased to provide adequate monitoring. The Environmental Protection Agency has approved the proposed water quality standards submitted by Indiana, making Indiana one of the first ten states to have such approval. The Stream Pollution Control Board has initiated approximately one hundred actions against polluters since January 1970. Almost ten per cent of Indiana municipalities lack secondary treatment. Furthermore sixty to seventy municipalities are located on streams that do not provide adequate year round dilution for secondary effluents. Generally most industries are taking action to provide adequate treatment facilities. But continuing water pollution control programs are needed to keep pace with industrial developments. In many suburban areas regional sewage and treatment facilities are needed to solve problems of sewage disposal. (Brackins-Florida)
W72-14754

DOCUMENTS FOR THE U.N. CONFERENCE ON THE HUMAN ENVIRONMENT, STOCKHOLM, JUNE 5-16, 1972--PART III.
Department of State, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14773

STOCKHOLM CONFERENCE ON THE HUMAN ENVIRONMENT,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14774

PEPPER V. NAIMISH (RIPARIAN RIGHTS IN WATER BODY BASED ON CONTIGUITY WITH WATER BODY ON OWNER'S LAND).

197 N.W.2d 866-867 (Mich. Ct. App. 1972).

Descriptors: *Adjacent landowners, *Judicial decisions, *Michigan, *Access routes, Channels, Legal aspects, Dredging, Common law, Right-of-way, Boundaries (Property), Relative rights, Water law, Easements, Legal review.
Identifiers: Injunctive relief.

Plaintiffs, owners of land in Highland Township, Michigan, brought suit to restrain defendant, adjacent landowners, from interfering with their right of access to a body of water on defendants' land. Defendants have made substantial improvements on their property over the years, including dredging a channel from Duck Lake, which exists on their property. The channel is separated from the water on plaintiffs' property by a roadway. As a result of defendants' operations this roadway has been filled in. Plaintiffs claim that this barrier interferes with their access to Duck Lake from the small body of water on their property. The Court of Appeals of Michigan held that based on the facts presented the lower court's finding that Duck Lake and body of water on plaintiffs' property were never contiguous was not clearly erroneous and should therefore be affirmed. The court ruled that when one owns property on a small body of water which is connected to a larger body of water at normal legal water level, he has riparian rights in the larger body. (Widman-Florida)
W72-14775

DEPT. OF PUBLIC HEALTH V. CUMBERLAND CATTLE CO. (POLLUTION OF WATER SOURCE BY DAIRY FARM OPERATIONS).

282 N.E.2d 895-906 (Mass. 1972).

Descriptors: *Massachusetts, *Judicial decisions, *Agricultural runoff, *Pollution abatement, Administrative agencies, Legal review, Legal aspects, State governments, Administrative decisions, Law enforcement, Water quality control, Regulation, Standards, Equity, Water supply, Water pollution sources, Farm wastes.

Plaintiffs State Health Department and town Board of Health brought suit in equity and for contempt against defendant dairy farm owner for alleged acts of pollution and carrying on noisome trade. Defendant contended that provisions of the state noisome trade statute were inapplicable to dairy farms. The Supreme Judicial Court of Massachusetts held that the statute providing for regulation of trades which may result in nuisance or be dangerous to the public health and providing conditions for appeal from an order of town board has clear application to a dairy farm operated as a nuisance. The court also held that under the statute where a dairy farm owner continues to violate a town board's orders to cease committing acts of pollution, that the farmer's failure to comply with the order pending the appeal is sufficient reason to deny the appeal. The court ruled that unnecessary and unreasonable storage of vast quantities of solid and liquid manure, in places where it can cause pollution of streams nearby is not an ordinary method of agriculture within the meaning of the statute. The court also ruled that if defendant could convince the court of its willingness to comply with the order that it could continue its operation in modified form pending compliance. (Widman-Florida)
W72-14776

BLOMQUIST V. COUNTY OF ORANGE (STATE CONSERVATION LAW COMPLIANCE AS A CONDITION TO WATER SUPPLY DEVELOPMENT).
332 N.Y.S.2d 546-552 (Sup. Ct. 1972).

Descriptors: *Water supply development, *New York, *Judicial decisions, *Bond issues, Legal aspects, Financing, Standards, Water supply, Water resources development, Legal review, Constitutional law, Equity, Conservation, Permits.
Identifiers: *Injunctive relief, Declaratory judgment.

Defendant county adopted a $5,000,000 serial bond and capital note resolution to pay for various county purposes including land acquisition for proposed reservoir sites. No engineering studies were conducted to determine the feasibility of the proposed sites and no submission was made to the Water Resources Commission pursuant to the Conservation Law. Plaintiff landowner brought suit seeking (1) a judgment declaring defendant bond resolution unconstitutional, illegal and void; (2) an injunction against further payment of monies or acquisition of property authorized by the resolution; and (3) money damages. In denying plaintiff's motion for summary judgment the Supreme Court, Orange County, held that where the county bond resolution does not state the specific purpose of the bonds or that county has obtained the consent of the Water Resources Commission to purchase land, the resolution is vulnerable to challenge. The court further held that where the county has not complied with the Conservation law, which requires approval from the Water Resources Commission before condemning or acquiring lands for additional water supply, the court will enjoin further acquisition of land for that purpose or any unspecified purpose until the county complies with such provisions. (Widman-Florida)
W72-14777

BEANE V. MCMULLEN (LIABILITY FOR ALTERATION OF FLOW OF SURFACE WATERS).

291 A.2d 37-55 (Md. Ct. App. 1972).

Descriptors: *Adjacent landowners, *Maryland, *Surface waters, *Surface drainage, Legal aspects, Flow, Water law, Abatement, Surface runoff, Drainage, Alteration of flow, Drainage patterns, Drainage engineering, Judicial decisions, Flow augmentation, Floods, Natural flow.
Identifiers: Intentional torts, Injunctions (Mandatory).

Plaintiff landowners and defendant adjacent landowners sued each other for wilfully and wrongfully collecting surface waters which did not naturally flow onto their lands and casting them upon their respective property. The area had long had drainage problems and defendant had constructed a ditch and pipe which plaintiff alleged drained waters onto his land. The Maryland Court of Appeals held that an upper owner may not artificially increase or concentrate the natural flow of water and damage the lower owner as a result of this. The Court held that the evidence indicated that defendant and the County, a third party defendant, were damaging plaintiff's lands; affirmed the lower courts mandatory injunction requiring removal of the pipe and ditch; and reversed the lower court and remanded the case on the issue of the adequacy of the injunctive relief for plaintiff. (Widman-Florida)
W72-14778

THE ENVIRONMENTALIST AND RADIOACTIVE WASTE,
Lake Forest Coll., Ill. Industrial Management Inst.
For primary bibliographic entry see Field 05G.
W72-14779

THE NATIONAL OCEAN PROGRAM, IMPLEMENTATION AND BENEFITS,
M. Morton.
Vital Speeches of the Day, Vol. 38, p 264-267, February 16, 1972.

Descriptors: *Oceans, *Ships, *Transportation, *Natural gas, Coasts, Economics, Resources development, Manpower, Research and development, Resource allocation, Weather modification, Monitoring, Technology, Energy, Meteorology, Offshore platforms, Water pollution sources, Energy.
Identifiers: *Coastal waters.

Substantial economic and social benefits could be realized by developing our ocean resources, improving ocean transportation and trade, and successfully competing in the world market. Problems related to ocean pollution, expansion of trade and technological stagnation could be remedied by the implementation of three oceanic projects. The first project is the development and use of liquified natural gas (LNG) carriers. The role of LNG in the world energy market is projected to grow rapidly

in the seventies. The development of ocean transportation to carry the LNG would provide more jobs and eventually a less polluted atmosphere. The second project is the development of large, multi-purpose offshore platforms. In addition to providing jobs for persons in the coastal areas, such platforms would solve the expanding problem of handling the giant containerships and supertankers. The third project is the large-scale monitoring of the ocean environment, leading to its proper management and control. These systems would assess the 'state of health' of the oceans, detect pollutant levels and monitor and predict natural environmental phenomena. (Nielsen-Florida)
W72-14780

THE TENNESSEE WATER QUALITY CONTROL ACT OF 1971,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 05G.
W72-14781

THE PATHOLOGY OF LAKE ERIE,
For primary bibliographic entry see Field 05G.
W72-14782

SHOWDOWN ON DELAWARE BAY,
For primary bibliographic entry see Field 05G.
W72-14783

REVIEW OF THE LEGAL ASPECTS OF INTERNATIONAL WATER POLLUTION CONTROL,
For primary bibliographic entry see Field 05G.
W72-14784

FISHING RIGHTS AND UNITED STATES-LATIN AMERICAN RELATIONS.

Hearing--Subcomm. on Inter-American Affairs--Comm. on Foreign Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, February 3, 1972. 128 p, 4 tab, 6 append.

Descriptors: *International law, *International waters, *Commercial fishing, *Legislation, Foreign waters, Treaties, Oceans, International Boundaries and Water Commission, Legislation, Federal government, Water resources, Political aspects, Long-term planning, Water law, Legal aspects, Fishing, Legal review.
Identifiers: Inter-American Affairs, *Territorial waters.

The Inter-American Affairs Subcommittee hearing concerns the controversy between the United States and certain Latin American countries over fishing rights. Secretary of State for Inter-American Affairs, Charles A. Meyer, reviews the entire range of United States-Latin American relations with respect to the fishing controversy. Fisheries disputes arise from differences which the United States has with certain Latin American countries regarding the breadth of the territorial sea and coastal state rights over resources of the waters adjacent to their coasts. The origin of the respective claims and possible solutions are discussed. Legislation has been passed by Congress as vessel seizures have drawn increasing attention to the problems that exist. This body of legislation calls upon the executive branch to act or consider acting against countries that seize American fishing vessels. Secretary Meyer submitted into the record an example of a Draft Fisheries Agreement proposed by the United States for discussion with Chile, Ecuador, and Peru at Buenos Aires in September 1970. A copy of an agreement tween the United States and Brazil concerning shrimp is also included. (Waldron-Florida)
W72-14785

UPPER COLORADO RIVER BASIN.

Hearing on S.3283 and S.3287--Subcomm. on Water and Power Resources-- Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, April 12, 1972. 18 p, 2 tab.

Descriptors: *Legislation, *Colorado River Basin, *Government finance, *Water resources development, Long-term planning, Costs, Financing, Water supply, Administrative agencies, Federal government, Colorado River, Reservoir storage, Recreation, Fish conservation, Wildlife conservation, Irrigation programs, Municipal water, Electric power production.
Identifiers: *Department of the Interior.

S.3287 and S.3283 are identical bills to increase the authorization for appropriation for continuing the comprehensive development of the water resources of the Upper Colorado River Basin. The bill would increase the present $760 million appropriation authorization by $610 million. This is the current estimate of the amount required to complete construction of the storage units of the Colorado River Storage project and the participating projects, with related power transmission facilities, which were originally authorized by the Act of April 11, 1956. The hearings included the statement and questioning of G. G. Stamm, acting Commissioner of the Bureau of Reclamation of the Department of the Interior. (Waldron-Florida)
W72-14786

MOORE V. VENTNOR GARDENS (OWNERSHIP OF LANDS BELOW HIGH WATER MARK).

149 A.536-538 (N.J. Ch. 1930).

Descriptors: *New Jersey, *Riparian rights, *Ownership of beds, *Riparian land, Shores, High water mark, Boundaries (Property), Navigable waters, Beds, Streams, State jurisdiction, Accretion (Legal aspects), Land tenure, Judicial decisions, Legal aspects, Beds under water, Watercourses (Legal aspects), Waterlaw.

Plaintiff mortgagee sought foreclosure of a mortgage and alleged the lands under water adjacent to the premises were subject to the mortgage. Defendants were grantees of the state of New Jersey of the riparian rights adjoining the mortgaged premises, having acquired them before the foreclosure of the mortgage. The New Jersey Court of Chancery dismissed plaintiff's bill. The United States Supreme Court had adversely disposed of a situation similar to plaintiff's. Under the riparian laws of New Jersey, lands below high water mark--shores and submerged lands of navigable waters--are the property of the State. Title and interest in these lands is a distinct and separate estate to be dealt with and idsposed of in accordance with statutory law. Title under the New Jersey grants is not only of a new estate, but in a new subject divided from the upland or riparian property by a fixed and permanent boundary. Thus the lien of the mortgage extends no further than the land described therin and the lands acquired from the State are not subject to it. (Duss-Florida)
W72-14787

PEACEFUL USES OF THE SEA-BED.
Committee on the Peaceful Uses of the Sea Bed and the Ocean Floor Beyond the Limits of National Jurisdiction (UN), New York.

U.N. Monthly Chronicle, Vol. 8, p. 51-54, August 1971. 4 p.

Descriptors: *International commissions, *International law, *Beds under water, *United Nations, Law of the sea, Oceans, Continental shelf, Sub soil, Resources, Pollution, Resources development, Conservation, Research and development, International waters, Exploitation, Pollution abatement, Political aspects, Political constraints, Institutions, Legal aspects.
Identifiers: *U.N. Committee on Peaceful Uses of the Seabed.

The Committee concluded its second 1971 session on 27 August by adopting its report to the General Assembly. The main committee attempted to resolve the following outstanding issues: establishment of an equitable international regime for the area and the resources of the sea-bed and the ocean floor, and the subsoil thereof; and the international machinery and the economic implications of exploitation of the sea-bed. The issues considered by Sub-Committee I included the following: the instrument by which the international regime should be established; the regime and its limits; orderly development of the marine environment; and sharing in benefits to be derived from the development of the resources of the area. Sub-Committee II debated topics covering the regime of the high seas, the continental shelf, the territorial sea and contiguous zone, and fishing and conservation of the living resources of the high seas. Sub-Committee III considered the preservation of the marine environment including the prevention of pollution and matters relating to scientific research. (Nielsen-Florida)
W72-14788

ASPECTS OF AQUIFER MANAGEMENT,
Environmental Protection Agency, Ada, Okla. National Groundwater Research Program; and Environmental Protection Agency, Washington, D. C. Water Quality Office.
For primary bibliographic entry see Field 04B.
W72-14876

CITY PLANNING AND POLITICAL VALUES,
Rutgers - The State Univ., New Brunswick, N.J.; and Columbia Univ., New York.
S. S. Fainstein, and N. I. Fainstein.
Urban Affairs Quarterly, Vol. 6, No. 3, p 341-362, March 1971. 21 ref.

Descriptors: *City planning, *Political aspects, *Decision making, *Formulation, Technology, Urbanization.
Identifiers: *Implementation, Typology.

As the breadth of planning increases and as it affects more aspects of the urban environment, it becomes important to understand the political implications of different kinds of planning. Even though many aspects of the planning process are technical and 'nonpolitical', the way in which a plan is formulated and implemented can be treated in the same terminology as political decision making. Four kinds of planning are discussed: (1) traditional - the planner prescribes both the goals and the means of the plan, (2) user-oriented - the desires of the clients become the goals of the plan, (3) advocacy planning - recognition of a multitude of conflicting social interests, and (4) incremental planning - the policy maker comes to the decision by weighing the marginal advantages of a limited number of alternatives. Four major types of political theory are discussed: (1) technocratic thinking - a product of the industrial era, (2) democratic theory - the primacy and sanctity of the individual, (3) socialist theory - conflict analysis of society, and (4) liberal theory - guarantee of the rule by law. This typology of planning types and political theories shows that the concepts of planning are not only analogous to certain trains in modern political thought, but actually are fragments of these political formulations. (Strachan-Chicago)
W72-14884

STATE WATER PLANNING IN TRANSITION,
G. J. Kelnofer, Jr.
Journal of Soil and Water Conservation, Vol. 27, No. 3, p 98-99, May-June 1972.

Descriptors: *State governments, Water resources development, *Environment, *Planning, *Management, *City planning, Federal government, Decision making, Personnel management, Administration.
Identifiers: *Metropolitan water resources management, *Policy making, Increased efficiency, Responsibilities, Reorganization, Public participation.

Water resources planning must consider the role of the states in managing water and other related land resources. Years of dependency on federal initiatives in this field have left many states poorly prepared to assume the responsibilities that they would now claim as theirs. Many state governments are too understaffed and poorly trained to perform competently as resource managers. State governments frequently lack an organizational framework suited to the task of management. It is generally argued that the states could do a better job of managing water and related resources if their resource agencies were organized along more efficient lines. The idea of increasing efficiency through the consolidation of agencies and the addition of new agencies with more power and personnel is attractive, and of substantial merit. However, there is some skepticism cast upon reorganization proposals. There is belief that the system of divided responsibility can be made to work more effectively. In addition, public participation is minimal. The major interests of the states and the nation do not lie in the areas of environmental problems, but rather, in the area of problems of defense, education, welfare, and transportation. Although the US is characterized as an urban and metropolitan society, it is recommended that a decision making process be developed which will respect the majority values of an urban people without doing irreparable damage to the legitimate needs of the rural-based producers of the food and fiber which are needed by the urban society. (Strachan-Chicago)
W72-14893

THE COUNCIL ON ENVIRONMENTAL QUALITY: AN EVALUATION,
North Carolina Univ., Chapel Hill.
R. N. L. Andrews.
Journal of Soil and Water Conservation, Vol. 27, No. 1, p 8-11, January/February 1972. 2 photo, 10 ref.

Descriptors: *Planning, *Decision making, *Environment, *Quality control, *Management, *Administration, Personnel management, Federal government, Land use, Projects, Evaluation, Economics, Costs, Benefits.

The Council on Environmental Quality (CEQ) is evaluated in terms of its powers, achievements, and problems during its first years of existence in order to put in accurate perspective both its potentials and its limitations. Since its establishment, CEQ has been responsible for a wide range of policy actions, including at least six executive orders, e.g.: reversal of a ruling by the Internal Revenue Service denying tax-exempt status to nonprofit environmental law groups; discontinuation of construction on the Cross-Florida Barge Canal; formulation of the president's 1971 environmental legislative program; and establishment, organization, and budgeting of the new Environmental Protection Agency. In addition to the legal limitation on its power to compel action, CEQ has suffered from several administrative problems. The first problem resulted from the heavy responsibilities which were thrust upon it before complete funding. It operated for a year with an inadequate staff borrowed from other agencies. A second and ongoing problem is that of the small size and unbalanced composition of CEQ's staff. In addition, there is no objective framework for systematically evaluating the environmental consequences of federal actions and weighing them against traditional costs and benefits. CEQ must operate with the awareness that its future effectiveness is intimately related to the fate of the environmental issue in general. Two particular problems appear likely to figure prominently in CEQ's activities in the near future: land use, and project evaluation criteria, especially the problem of relating environmental quality criteria to traditional economic criteria for project justification. (Strachan-Chicago)
W72-14895

WALLISVILLE LAKE, TRINITY RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 08A.
W72-14929

WELLS AND STREAMS: RELATIONSHIP AT LAW,
Missouri Univ., Columbia. Coll. of Law.
For primary bibliographic entry see Field 04B.
W72-14934

DISCHARGING NEW WINE INTO OLD WINESKINS: THE METAMORPHOSIS OF THE RIVERS AND HARBORS ACT OF 1899,
For primary bibliographic entry see Field 05G.
W72-14935

EVOLVING SOCIAL ATTITUDES ON POLLUTION CONTROL,
Cincinnati Univ., Ohio. Environmental Health Engineering.
For primary bibliographic entry see Field 05G.
W72-14936

WATER QUALITY STANDARDS SUMMARY FOR THE INTERSTATE WATERS OF NEBRASKA.
Environmental Protection Agency, Washington, D.C.; and Nebraska State Dept. of Environmental Control, Lincoln.
For primary bibliographic entry see Field 05G.
W72-14956

6F. Nonstructural Alternatives

GEOLOGIC HAZARDS AND LAND-USE PLANNING,
For primary bibliographic entry see Field 06B.
W72-14580

ZONING FOR BEAUTY,
Ross, Hardies, O'Keefe, Babcock, McDugald and Parsons, Chicago, Ill.
M. deH. Newsom.
Land-Use Controls Quarterly, Vol 3, No 3, p 33-42, Summer 1969.

Descriptors: *Zoning, *Aesthetics, *Land use, *Control, *Regulation, *City planning, Land development, Construction, Design criteria, Administration.
Identifiers: *Policy making, Low income housing.

Ways in which land-use controls can be used to achieve urban beauty are discussed. Aesthetic concern for the inner city will come in response to the following types of proposed action relating to the use of land: (1) construction of new large-scale developments, (2) construction of new single, small, or scattered developments, (3) demolition, deterioration, or alteration of extensive districts or areas already built up, (4) demolition, deterioration, or alteration of landmarks or other individual structures already in existence, (5) establishment of new open space, (6) destruction or alteration of existing open spaces, (7) construction of new public works such as street furniture, and (8) destruction, deterioration, or alteration of existing public works. What zoning can do to encourage urban beauty is discussed. (1) Zoning can prohibit the construction of buildings that do not meet certain design criteria. (2) Zoning can encourage the construction of buildings that meet certain design criteria by granting bonuses to the developer for meeting these criteria. (3) Zoning can discourage the construction of buildings that do not meet certain design criteria. Problem areas are in the issues of low-income housing and administration and policies. (Strachan-Chicago)
W72-14880

THE HOUSTON SOLUTION: THE CASE FOR REMOVING PUBLIC LAND-USE CONTROLS,
B. H. Siegan.
Land-Use Controls Quarterly, Vol. 4, No. 3, p 1-19, Summer 1970.

Descriptors: *Land use, *Land development, *Control, *Regulation, *Management, Zoning, Legislation, Governments, *Texas.
Identifiers: *Houston (Tex.).

As a result of an extensive study of land use and development in Houston and other medium-sized Texas cities without zoning, it is concluded that the Houston system of non-zoning offers the most preferable alternative to obviating the problems arising from or created by the prevailing system of land-use controls. A private market, regulated by relatively few ordinances, is better able to serve the community than is the mixture of planning, law, and politics known as zoning. The Houston experience reveals that regulation of land use is neither necessary nor desirable to the functioning of a community. Legislation should, therefore, move in the direction of doing away with controls and creating a much less restricted market. The powers of the municipalities should be lessened, and they should not be replaced by those at higher levels of government. Changing the direction of land-use controls from the local to the regional or federal levels and giving more discretion to government may cure some of the problems of zoning, but it will probably create as many or more, for the real problem is government controls. Over half a century of experience with zoning clearly illustrates that governmental control over land-use generally has been unworkable and inequitable and an impediment to the real estate market and its consumers. (Strachan-Chicago)
W72-14883

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 08A.
W72-14931

6G. Ecologic Impact of Water Development

INTERGOVERNMENTAL RELATIONS IN WATER RESOURCES ACTIVITIES.
Wendell and Schwann, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14238

HEARINGS--PUBLIC WORKS FOR WATER, POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATIONS FOR FISCAL YEAR 1973--PARTS 1-5.
For primary bibliographic entry see Field 05G.
W72-14251

POWERPLANT SITING AND ENVIRONMENTAL PROTECTION, PART 2.

Hearings--Subcomm. on Communications and Power--Comm. on Interstate and Foreign Commerce, U.S. House of Representatives, 92d Cong, 1st Sess, Part 2, p 375-764, May 4, 6, 7, 11, 12, 13, 25, 26, 27, 1971. 390 p, 3 fig, 10 map, 26 tab, 2 chart.

Descriptors: *Electric powerplants, *Sites, *Environmental effects, *Decision making, Project planning, Federal government, Legislation, State governments, Regional analysis, Adoption of practices, Administrative decisions, Political aspects, Social aspects, Economic impact, Standards, Water pollution sources, Electric power demand, Public utilities, Federal jurisdiction, State jurisdiction, Federal Power Act, Governmental interrelations.
Identifiers: *Electric power consumption, Powerplant Siting Act of 1971 (Proposed).

Testimony by industry and government representatives before the House Subcommittee on Communications and Power is included. The testimony concerns several bills which have been introduced related to powerplant siting. Common problems which are touched on by most of the witnesses include: the basic responsibility of utilities to plan for an adequate power supply; coordinated long-range planning between suppliers; interdisciplinary approach to planning so as to consider resources, needs, and environmental values; institutional mechanisms for working out conflicting interests and completion of interconnecting networks; and recognition of a need for a speedy resolution of disputes and for a speedy transition from state to federal siting controls. Appendixes accompanying testimony provide statistical information concerning specific projects and figures and tables relevant to the magnitude of the reliability and environmental problem of siting. A comparison of major siting bills is included. Testimony also deals with some of the technical aspects of powerplant siting such as capacity evaluation and ecological impact and with some of the administrative problems involved such as the need to cut down on the number of agency approvals. (Grant-Florida)
W72-14252

GATEWAY AREA PROPOSALS.

Hearings on H.R. 1370, H.R. 1121 and Related Bills--Sub. Comm. on National Parks and Recreation--Comm. on Interior and Insular Affairs, House of Representatives, 92d Cong, 1st Sess, June 26, July 19, 20, 1971. 425 p.

Descriptors: *Legislation, *National recreation areas, *National seashores, *New York, New Jersey, Political aspects, Bays, Beach erosion, Shores, Recreation demand, Recreation facilities, Wetlands, Political constraints, Water utilization, Land use, Water quality, Water resources, Water sports, Water resources development, Water quality control.
Identifiers: Coastal waters.

Evaluated are various bills providing recreation areas in the metropolitan New York City area. H.R. 1370 establishes the Sandy Hook National Seashore in New Jersey. H.R. 1121 and other related bills provide for the establishment of the Gateway National Seashore on the Gateway National Recreation Area in New York and New Jersey. Various bills included authorize the Secretary of the Army to undertake water resource development within the specified areas including the control of shoreline erosion and navigation improvements. Testimony largely concerns the question of the acquisition of certain lands surrounding the Breezy Point, Jamaica Bay, and Sandy Hook areas. The importance of adequate provisions for erosion control to protect the shoreline and beaches is stressed. It is emphasized that adequate provisions to protect the waters, wetlands, and islands of Jamaica Bay are a necessity. It is pointed out that certain areas encompassed are unsafe for swimming, but that action is being taken to upgrade the water quality in those areas, especially Jamaica Bay. (Ellis-Florida)
W72-14253

NAVIGATION OF THE KANSAS RIVER, LAWRENCE TO THE MOUTH (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W72-14260

SMALL BOAT HARBOR, PORTSMOUTH STATE PARK, OHIO, OHIO RIVER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 04A.
W72-14261

SAN LEANDRO CREEK SMALL FLOOD CONTROL PROJECT, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08D.
W72-14262

SCITUATE HARBOR, SCITUATE MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14263

MAINTENANCE DREDGING, SCITUATE HARBOR, MASSACHUSETTS (DRAFT ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14264

SWEETWATER CREEK WATERSHED PROJECT, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-14265

CHOWAN RIVER, NORTH CAROLINA, BLACKWATER RIVER, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 08D.
W72-14266

BIG CREEK AND TRIBUTARIES, LOWER WHITE RIVER BASIN, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W72-14267

LIBBY DAM AND LAKE KOOCANUSA, KOOTENAI RIVER, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-14268

DIKED DISPOSAL AREA PROGRAM, ONTONAGON HARBOR, ONTONAGON, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-14270

DIKED DISPOSAL AREA PROGRAM, ASHLAND HARBOR, ASHLAND, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-14271

BLACK ROCK CHANNEL AND TONAWANDA HARBOR, NEW YORK (OPERATION AND MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14272

ROCHESTER HARBOR, MONROE COUNTY, NEW YORK (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14273

ZUMBRO RIVER, MINNESOTA, KELLOGG TO MOUTH, WABASHA COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 08D.
W72-14274

HILLSDALE LAKE, BIG BULL CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08D.
W72-14275

SMALL NAVIGATION PROJECT, ANDREWS RIVER, HARWICH, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14276

NEW BEDFORD AND FAIRHAVEN HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14277

TRUMBULL LAKE, PEQUONNOCK RIVER, TRUMBULL, CONNECTICUT (UPDATED FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-14278

DOG RIVER, MOBILE BAY, ALABAMA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14279

THE 1969 UPPER MISSISSIPPI RIVER DREDGE SPOIL SURVEY FROM HASTINGS, MINNESOTA TO CAIRO, ILLINOIS,
Missouri Dept. of Conservation, Jefferson City.
For primary bibliographic entry see Field 05G.
W72-14374

EFFECTS OF A PROPOSED 35-FOOT CHANNEL TO RICHMOND ON CURRENTS AND SALINITIES OVER THE SEED OYSTER BEDS IN JAMES RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05C.
W72-14376

SOME ENVIRONMENTAL FACTORS TO BE CONSIDERED IN THE DESIGN OF THERMAL POWER PLANTS IN THE NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 05G.
W72-14394

THERMAL DISCHARGES - AN OVERVIEW,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 05G.
W72-14399

ENERGY USE IN CALIFORNIA: IMPLICATIONS FOR THE ENVIRONMENT,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 05C.
W72-14408

SIGNED DIGRAPHS AND THE GROWING DEMAND FOR ENERGY,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 06D.
W72-14411

THE ECE SYMPOSIUM ON PROBLEMS RELATING TO ENVIRONMENT,
Woodrow Wilson International Center for Scholars, Washington, D.C.
R. E. Stein.
American Journal of International Law, Vol 66, No 1, p 118-123, 1972. 24 ref.

Descriptors: *United Nations, *Environmental control, *Regional development, *Information exchange, Coordination, Foreign countries, Governments, Economics, Political aspects, Planning, Environment, Regional analysis, Water resources development, Information retrieval, Control, Organizations, Comprehensive planning, Water law, International law, Legal aspects, International commissions.
Identifiers: *U.N. Economic Commission for Europe.

The United Nations Economic Commission for Europe (ECE) held a symposium in Prague, Czechoslovakia, May 3-10, 1971, on problems relating to environment, which had the sole purpose of providing an opportunity for an exchange of views on selected problems in the field. The agenda was divided into two major sections: (a) a survey of the present environmental situation, including a detailed examination of problem sectors and problem areas; and (b) a discussion of various means of environmental improvement on the national and international levels. The present situation was viewed through a series of country monographs on problems relating to the environment. The symposium reached general and tentative conclusions in the areas of plant locating, regional planning, information exchange, and international cooperation in environmental management. Panel discussions were held on major socio-economic questions relating to the environment and economic aspects of environmental improvement from the viewpoints of the centrally planned and market economies. The test of the ECE will depend on the strength of its future work program and on making the ECE a principal focus of East-West cooperation and coordination. (Widman-Florida)
W72-14546

JETPORT: PLANNING AND POLITICS IN THE BIG CYPRESS SWAMP,
Florida Univ., Gainesville. Coll. of Law.
M. Kessler, and L. Teply.
Miami Law Review, Vol 25, No 4, p 713-748, 1971. 212 ref.

Descriptors: *Administrative decisions, *Water quality control, *Decision making, *Environmental effects, Water pollution, Water pollution control, Administrative agencies, Administration, Regulation, Governmental interrelations, Institutional constraints, Water management (Applied), Water resources conservation, Project planning, Federal government, Local governments, Water conservation, Land use, Water pollution sources, Urbanization, Florida, Political aspects, Social aspects.
Identifiers: South Florida Jetport controversy.

The Miami Jetport Controversy exemplifies problems encountered by administrative agencies in assessing and coping with environmental issues. Involved is a conflict between the need for expanded transportation facilities and the need of the public to protect the Everglades. The allocation of governmental responsibility is discussed, including the state and local agencies, the Federal Aviation Administration and the Interior Department. Planning of the jetport is chronicled from 1952 until the present with discussion of the increasing transportation needs of the area. Also included is consideration of alternative sites. The growth of opposition by conservationists is followed with discussion of various studies of the environmental effects of the jetport and alternative solutions to the area's transportation problems. The crucial water table situation and the delicate ecology of the south Florida area are discussed. Mission oriented agency causes of the controversy are discussed. These agencies often have difficulty understanding the problems and viewpoints of other interests. Public participation in the decision making process and the role of the scientist in policy making are discussed. (Brackins-Florida)
W72-14548

EVERGLADES-BIG CYPRESS NATIONAL RECREATION AREA.
For primary bibliographic entry see Field 06B.
W72-14556

INTERNATIONAL COOPERATION IN THE HUMAN ENVIRONMENT THROUGH THE UNITED NATIONS.
For primary bibliographic entry see Field 06E.
W72-14557

PUGET SOUND AND ADJACENT WATERS COMPREHENSIVE PLAN (DRAFT ENVIRONMENTAL STATEMENT).
Pacific Northwest River Basins Commission, Vancouver, Wash.

Available from the National Technical Information Service as PB-207 240-D, $3.00 in paper copy, $0.95 in microfiche. February 23, 1972. 18 p.

Descriptors: *Washington, *Comprehensive planning, *Environmental effects, *Water resources development, Flood protection, Flood control, Basins, Pollution abatement, Rivers, Estuarine environment, Habitats, Impoundments, Navigation, Watershed management, Water supply development, Water quality control, Water utilization, Water quality, Water supply, Recreation, Land use, Feasibility, Classification, Water storage.
Identifiers: *Environmental Impact Statements, *Puget Sound (Wash), Coastal waters.

The comprehensive plan for Puget Sound consists of various water and land related resource categories. Additional storage facilities are proposed along the Noonsack, Cedar, and Sultan Rivers. Water quality control elements of the plan include improved monitoring and surveillance systems on rivers, lakes, and marine shoreline together with preparation of basin-wide sewage plans for pollution abatement and waste water control. The flood damage reduction portions include flood plain management, levees, channel improvements and upstream storage. Watershed management measures proposed include reforestation, erosion control, and fire control. Marine and estuarine environments will be affected by the proposed channel deepening and widening and small boat harbor navigation improvements. Freeflowing segments of various rivers would be lost at proposed impoundment sites as would wildlife habitat and lumber producing lands. Channel improvements for flood protection would disrupt the ecology of segments of two of the area's rivers. Navigation channel dredging and disposal could also create problems. Direct river pumping and treatment, desalinization, diversion, storage, increased groundwater utilization, and improved water yield through various watershed management practices were considered as means for satisfying water supply needs. Only desalination proved uncompetitive. Various alternatives were also examined to satisfy water quality and flood protection needs. (Ellis-Florida)
W72-14558

WINTERS CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-14559

LEVEE AND DRAINAGE MODIFICATIONS SCAPPOOSE DRAINAGE DISTRICT; COLUMBIA RIVER, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 04D.
W72-14560

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14561

EDEN WATERSHED, MISSISSIPPI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Jackson, Miss.
For primary bibliographic entry see Field 04D.
W72-14562

WATER TREATMENT FACILITIES, FOSS RESERVOIR, CUSTER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Fort Worth, Tex. Region VI.
For primary bibliographic entry see Field 05F.
W72-14563

PERICO ISLAND PERMIT APPLICATION, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-206 105D. $3.00 in paper copy, $0.95 in microfiche. January 1972. 26 p, 1 map, 1 illus.

Descriptors: *Environmental effects, *Land use, *Land reclamation, *Florida, Dredging, Canal construction, Intertidal areas, Mud flats, Aquatic habitats, Terrestrial habitats, Monetary benefits, Permits, Soil disposal areas, Shellfish, Oysters, Sewage disposal, Water quality control, Turbidity, Sedimentation.
Identifiers: *Environmental Impact Statements, *Perico Island (Fla).

The proposed residential development site is located on the south half of Perico Island approximately five miles west of Bradenton, Florida. Approximately 2.1 million cubic yards of material will be dredged to produce approximately 370 acres of usable upland and 92.4 acres of canals from former upland. Seawalls will be constructed around the perimeter of the island. Environmental impacts of the project include loss of grassland and tidal flats caused by filling which will destroy part of the estuarine environment and the marine food chain, increased recreational values with attendant noise and pollution, increased turbidity during construction, lessened siltation, and elimination of the existing mosquito hazard. Adverse impacts include loss of the submerged mud flats and associated fauna, loss of grasslands, loss of 0.4 acres of coon oyster beds, and temporary water quality degradation. Alternatives which were considered include modified development, partial continued agricultural use, public purchase and use of the land, and no development. Development would mean the relatively irreversible commitment of 360 acres of undeveloped upland and submerged land to the uses of man. (Waldron-Florida)
W72-14564

DUST ABATEMENT AT CANYON FERRY LAKE, CANYON FERRY UNIT, HELENA-GREAT FALLS DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Billings, Mont. Region 6.
For primary bibliographic entry see Field 04D.
W72-14565

TRAINING DIKE AND BREAKWATER, EVERETT HARBOR, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-14566

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK AT AND IN THE VICINITY OF BREWSTER, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 08D.
W72-14567

ALTERNATE DISPOSAL METHOD FOR DETROIT AND ROUGE RIVERS, WAYNE COUNTY, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 05G.
W72-14568

LINCOLN LAKE, EMBARRAS RIVER, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.
W72-14569

MUD MOUNTAIN DAM AND RESERVOIR, WHITE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08D.
W72-14570

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14571

SCITUATE HARBOR, SCITUATE, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14572

PROPOSED CLOSED BASIN DIVISION, SAN LUIS VALLEY PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-14573

ANACOSTIA RIVER AND TRIBUTARIES, PRINCE GEORGES COUNTY, MARYLAND, LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-14574

DUCK RIVER PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Science.
For primary bibliographic entry see Field 08A.
W72-14575

A CURRENT PROBLEM IN THE ENVIRONMENTAL CRISIS, MERCURY POLLUTION, AND ITS LEGAL IMPLICATIONS,
Washington Univ., St. Louis, Mo. Center for Biology of Natural Systems.
B. Commoner.
Natural Resources Lawyer, Vol 4, p 139-152, 1971. 4 ref.

Descriptors: *Mercury, Water pollution, *Legal aspects, Legislation, Economics, Social impact, Regulation, Technology.
Identifiers: *National Environmental Policy Act, Environmental Impact Statement, Information accessibility.

The history of the mercury pollution problem in the United States is traced and the ratio of the economic value of a technological advance to its environmental costs is examined. Four issues generated by the environmental crisis which point toward problems in the law are presented: controlling pollution by making social judgments which balance overall benefits against social costs; insuring adequate public access to information on environmental problems; legal action necessary on a local level in order to handle local environmental problems; and changing the base of legal education so as to make it more relevant to today's social problems. The problem of effective laws governing environmental pollution is discussed with emphasis on the National Environmental Policy Act of 1969 and the requirement for federal agencies to prepare a statement on the environmental impact of proposed federal actions. From examples of a variety of environmental problems it is concluded that out technological system of productivity is degrading its own essential environmental base and therefore is self-destructive. (Eagle-Vanderbilt)
W72-14631

MERCURY POLLUTION: THE MAKING OF AN ENVIRONMENTAL CRISIS,
Massachusetts Inst. of Tech., Cambridge. Lab. of Nuclear Science.
For primary bibliographic entry see Field 05C.
W72-14637

ECOLOGICAL ASPECTS OF RADIOACTIVITY IN THE MARINE ENVIRONMENT,
Bureau of Commercial Fisheries, Beaufort, N.C. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W72-14658

SOME ECOLOGICAL POINTS REGARDING WATER POLLUTION, (EINIGE OKOLOGISCHE GESICHTSPUNKTE BEIM GEWASSERSCHUTZ),
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
For primary bibliographic entry see Field 05B.
W72-14669

NATURAL REGENERATION OF THE KAMBUI HILLS FOREST IN EASTERN SIERRA LEONE: I. ECOLOGICAL STATUS OF THE LOPHIRA/HERITIERA RAIN FOREST,
Forestry Dept., Sandakan (Malaysia). Research Branch.
For primary bibliographic entry see Field 04A.
W72-14696

CONNECTICUT RIVER BASIN PLAN FOR COMPREHENSIVE DEVELOPMENT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 08A.
W72-14751

PUEBLO DAM AND RESERVOIR, FRYING-PAN-ARKANSAS PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo. Region 7.
For primary bibliographic entry see Field 08A.
W72-14753

SUGAR AND BRIAR CREEKS PROJECT, CATAWBA RIVER BASIN, NORTH CAROLINA AND SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-14755

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATER ALONG THE LOUISIANA COAST (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 05G.
W72-14756

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.

W72-14757

BLUE SPRINGS LAKE, LITTLE BLUE RIVER LAKES, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-14759

JACKSONVILLE HARBOR, FLORIDA (SECTION I). NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W72-14760

MANITOWOC HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 04A.
W72-14761

MAINTENANCE OF THE WESTCHESTER CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-14762

TESORO TANK FARM AND BARGE SLIP, JUNEAU, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-14763

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04D.
W72-14764

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-14765

LONG HOLLOW CREEK CHANNEL CLEARING, NEZ PERCE, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 04A.
W72-14766

BALDWIN AND HANNON SLOUGHS, MONTGOMERY, ALABAMA, FLOOD PROTECTION (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14768

PANAMA CITY HARBOR, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Office of the Chief of Engineers (Army), Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-14769

KINGSTREE BRANCH FLOOD CONTROL PROJECT, BLACK RIVER BASIN, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-14770

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 08D.
W72-14772

DOCUMENTS FOR THE U.N. CONFERENCE ON THE HUMAN ENVIRONMENT, STOCKHOLM, JUNE 5-16, 1972--PART III.
Department of State, Washington, D.C.

Available from the National Technical Information Service as PB-206 618-3, $3.00 in paper copy, $0.95 in microfiche. March 1972. 85 p.

Descriptors: *United Nations, *Water resources development, *Environmental control, *Governmental interrelations, Coordination, Comprehensive planning, Governments, International commissions, International water, Water management (Applied), Management, Regulation, Multiple-purpose projects, Water law, Conferences, Publications, Monitoring, Technology.
Identifiers: *U.N. Conference on the Human Environment.

Current activities of the United Nations system are discussed including the planning and management of human settlements for environmental quality; the environmental aspects of national resources management; identification and control of pollutants of broad international significance; educational, informational, social and cultural aspects of environmental issues; development and the environment; and multidisciplinary aspects of ongoing activities within the United Nations system of organizations. The environmental orientation of the United Nations system is described; functions and perspective in terms of information, collection, interpretation, analysis, and dissemination; monitoring and surveillance, including the development of sensors and indices of environmental change; research on environmental changes; development of scientific criteria and guides relevant to environmental quality; development of policy guidelines; establishment of national environmental institutions, legislation, and standards; establishment of regional and international agreements; development of technology; education, training, and public information; cooperation on technical aspects; and funding. The summary and conclusions of the Administrative Committee on Co-ordination (ACC) Consolidated Document on the United Nations system and the human environment are included. (Widman-Florida)
W72-14773

STOCKHOLM CONFERENCE ON THE HUMAN ENVIRONMENT,
Senate, Washington, D.C.
E. Muskie.
Congressional Record, Vol. 118, S8445-S8448 (daily ed.) May 25, 1972. 4 p.

Descriptors: *United Nations, *International commissions, *Budgeting, *Federal government, United States, Federal budget, Grants, Political aspects, Foreign countries, Environmental control, Governments, Government finance, Governmental interrelations, Administration, Economics, Regulation, Legislation, Coordination, Conferences, Costs, Federal Water Pollution Control Act.

The positions to be assumed by members of the United States delegation to the Stockholm Conference on the Human Environment will amount to a replay of narrow and retrogressive environmental policies. These positions are in conflict with environmental goals set forth by Congress in the Clean Air Amendments of 1970 and the Federal Water Pollution Control Act. Furthermore the United States is not willing to provide economic assistance to poorer nations. Included in the Record is the Scope Paper containing the United States positions. The overall United States objective for the conference is to raise the level of national and global capabilities to recognize and solve problems affecting the environment. There are five critical issues on which the United States must oppose recommendations contrary to its interests: creation of a fund to be used for economic development, creation of a new agency to deal with environmental problems, increase of financial support to deal with environmental problems of development, increased funding of environmental problems through United Nations specialized agencies, and any attempt to amend the Draft Declaration on nuclear testing. (Brackins-Florida)
W72-14774

THE ENVIRONMENTALIST AND RADIOACTIVE WASTE,
Lake Forest Coll., Ill. Industrial Management Inst.
For primary bibliographic entry see Field 05G.
W72-14779

STUDIES ALONG THE EDGE OF A LICHEN DESERT,
Sheffield Univ. (England). Dept. of Landscape Architecture.
For primary bibliographic entry see Field 05C.
W72-14873

THE RUN ON THE ENVIRONMENTAL BANK,
G. Clay.
Land-Use Controls Quarterly, Vol. 4, No. 2, p 1-11, Spring 1970. 18 ref.

Descriptors: *Environment, *Quality control, *Costs, Benefits, Pollution, Management, Planning, Decision making.
Identifiers: *Environment responsibility, Public participation.

A short history of the American attitude toward environmental quality control is presented. Certain facts of American life have become indicative of the need for environmental responsibility. (1) The American standard of living was achieved at fantastic costs, creating debts which are not coming due. (2) Freedom to move everywhere cheaply by automobile was achieved only at the high cost of air pollution and highway death and damage. (3) Machines and chemicals were being used to defoliate in Viet Nam. (4) The capacity to produce has become a dangerous capacity to overproduce. Certain trends in the society influence attitudes toward environmental control. (1) There is a growing militance about the future. (2) There is growing self-determinism among wider segments of the public. (3) Large-scale developments of every sort are distrusted. (4) Side-effects of environmental change are more predictable than ever. (5) All development is now subject to question and possible attack. The American public now sees its environment as a limited resource. It perceives that all environment is subject to man's management and influence. The Ecology Action movement is only the latest evidence that the public has begun a long-term run on the environmental bank. It sees all land as invested with the public interest. The public is determined to have increasing voice in decisions about its environment. (Strachan-Chicago)
W72-14882

MAN AND HIS ENVIRONMENT: THE ISSUES IN PERSPECTIVE,
Resources for the Future, Inc., Washington, D.C.

S. Brubaker.
Journal of Soil and Water Conservation, Vol. 27, No. 3, p 100-103, May-June 1972. 1 photo.

Descriptors: *Environment, *Quality control, *Planning, *Management, *Institutions, *Technology, Economics, Population, Income distribution, Consumptive use, Decision making, Short-term planning, Long-term planning.
Identifiers: *Policy making.

The root cause of environmental problems is identified as economic and demographic growth. These problems have been compounded by emphasis on incentives more appropriate to achieving growth than to improving environmental quality. Pressure on the environment could be reduced by restraining income growth. Improved design and durability of goods could alter patterns of consumption so as to reduce the required volume of materials. Nonmaterial forms of consumption - education, sport, music, and theater - could be stressed. In an ascending order of gravity, the environmental problems are identified as: (1) amenity considerations like litter, noise, and appearance of cities and countryside, (2) threats to human helath, (3) threats to human genetics and reproduction, and (4) effects on ecological systems which would threaten the earth's capacity to sustain life. The remedies which seem important could involve one or more of a wide variety of economic, institutional, and technological approaches. The classification of problems into short-term and long-term is useful. Short-term problems are those that already require remedial action to avert unacceptable congestion or to avoid permanent damage. Long-term problems strain the conventional decision apparatus. These two problem areas are not separate, since decisions made today will condition the possibilities of tomorrow. The prospect of solving the environmental problems is viewed optimistically. Technology and management can be improved to eliminate much environmental damage, and to generate a social dividend. (Strachan-Chicago)
W72-14892

SOCIETY, ENVIRONMENT, AND TECHNOLOGY: CHALLENGE AND OPPORTUNITY,
Department of Commerce, Rockville, Md.; and Maryland Univ., College Park.
J. R. Hibbs, and J. H. Cumberland.
In: Man and the Quality of His Environment, Western Resources Conference, 1967, University of Colorado Press, Boulder. 1968. p 3-15. 1 tab, 9 ref.

Descriptors: *Social aspects, *Environment, *Technology, Management, Planning, Population, Ecosystems, Costs.
Identifiers: *Policy making, Social-environmental-technological relationships.

(1) Man is in serious trouble with his natural environment. The assumption that environmental resources are unlimited is not valid in the face of technology and population explosions. (2) To solve the problems of a deteriorating environment requires recognition of the fact that 'man's ecosystem is the total of the interacting relationships between him and the physical, biological, and societal factors of the system'. (3) A multidisciplinary assault of effectively integrated physical, biological and social sciences is required to address and solve these problems. (4) A joint and multidisciplinary institute is proposed as one needed action to expand our systematic knowledge as a basis for meeting the challenge of the social-environmental-technological relationships. (5) Such an investment to provide both advances in the state-of-the-art and proposed problem solutions will cost less than one percent of current and foreseeable federal government expenditures caused by the deteriorating environment. (Strachan-Chicago)
W72-14900

LIVING WITH OUT WASTES,
California Univ., Richmond. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05G.
W72-14901

AN ECOLOGICAL PERSPECTIVE,
Illinois Univ., Urbana.
W. R. Boggess.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 23-35. 23 ref.

Descriptors: *Ecology, *Management, Sedimentation, Habitats, Ecosystems, Engineering, Technology, Planning, Governments.
Identifiers: *Conflicts of interest, Biocides, Self-interest.

The conflicts of interest which arise in management of the environment are discussed. The conflicts are: biocides, sedimentation, destruction of habitats, and preservation of habitats. Science has produced means of controlling both weeds and insects in the many biocides. However, many broad-spectrum biocides have adverse effects on populations other than those for which control is desired. Accelerated erosion of soil occurs with agriculture and the development of heavy earth-moving equipment. The presence of sediment particles in stream water is a form of pollution because biological populations are adversely affected. Man has been destroying natural habitats in a variety of ways. A given ecosystem possesses a degree of resilience and can absorb varying amounts of manipulation before breaking down. Conflicts of interest are bound to arise as the population pressure increases, and when additional land and resources are withdrawn from the marketplace in order to preserve habitats. The present status of man's ecosystem is not one to promote a spirit of optimism. Concerted effort will be required of science, engineering, and technology if the rebuilding process and planning for the future are to succeed. Self-interest must be replaced by a philosophy that dictates along lines of the greatest common good. The example of cooperation should be set at the top levels of government. Agencies, which are charged with building and construction, should develop a greater understanding of resource conservation and use. (Strachan-Chicago)
W72-14902

A CITIZEN'S COMMENTS ON CONSERVATION,
Colorado House of Representatives, Denver.
R. G. Gebhardt.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 37-43.

Descriptors: *Conservation, *Environment, *Quality control, Planning, Water pollution control, Legislation, Legal aspects, Regulation, Taxes, Zoning.
Identifiers: *Policy making, Commitment.

A layman's view of conservation problems is presented. Five problem areas of maintaining environmental quality control are: (1) beautification of the environment, (2) air pollution control, (3) water pollution control, (4) orderly development of large cities, and (5) waste disposal. The problems of water pollution control are discussed. The following are related to a quality environment: (1) divided parkways, (2) trees, and shrubs, (3) large beautiful schoolgrounds, (4) acreage in public building areas, (5) landscaped industrial parks, and (6) a city without utility poles. These qualities can be attained by: (1) legislative pilot programs on greenbelts, (2) laws on highways and rights-of-way, (3) allocation of a percentage of taxes for environment, (4) tax penalties for ugliness, (5) tax credits for private beautification, (6) requirement of percentage of land given by developers as condition of zoning, (7) assessed valuation concessions for land donations, (8) zoning changes to permit environmental consideration, (9) broader condemnation proceedings, and (10) an insistence from candidates for public office of their commitment to concern for environment. (Strachan-Chicago)
W72-14903

WATER QUALITY CONTROL FROM A STATE VIEWPOINT,
Wyoming State Dept. of Public Health, Cheyenne.
For primary bibliographic entry see Field 05G.
W72-14905

A STRUCTURE FOR THE TASK AND SOME AREAS FOR STUDY,
Wisconsin Univ., Madison. Water Resources Center.
I. K. Fox.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 129-140.

Descriptors: *Environment, *Quality control, Research and development, *Planning, Institutions, Technology, Behavior, Psychological aspects.
Identifiers: *Policy making.

A broad outline is presented of what concern with environmental quality appears to imply. The need for research on the kind of policy and institutional development that will accommodate advances in science and technology in such a way as to permit effective solutions to problems of wastes and contaminants is discussed. Some of the more difficult problems will not be solved by systems management, governmental regulations, subsidies and other popular instruments of public policy. A pleasing environment will be achieved through the adoption of modes of individual behavior that reflect an appreciation of environmental quality. Three classes of influences on the environment are: (1) waste disposal, (2) incidental contamination, and (3) development. Three kinds of environments are (1) wild, (2) rural, and (3) urban. Three problem areas in the work of the behavioral sciences are (1) inducing individual and corporate behavior to achieve socially desirable environmental conditions, (2) development of efficient arrangements for wastes and contaminants, and (3) motivating desirable patterns of developmental design. (Strachan-Chicago)
W72-14907

FOUR PROBLEM AREAS,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 05C.
W72-14908

OUR RESOURCE ENDOWMENT AND OUTDOOR RECREATION,
Bureau of Outdoor Recreation, Denver, Colo. Mid-Continent Regional Office.
For primary bibliographic entry see Field 06B.
W72-14909

METROPOLITAN GROWTH -- ENCROACHMENT OR ORDERLY PROCESS,
Department of Housing and Urban Development, Washington, D.C. Land and Facilities Development Administration.
For primary bibliographic entry see Field 05G.
W72-14910

URBAN OPEN SPACE: PSYCHO-SOCIO AND LEGAL DIMENSIONS,
Colorado Open Space Foundation, Denver.
For primary bibliographic entry see Field 06B.
W72-14911

BOULDER, COLORADO: A STUDY IN GROWTH,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 03D.
W72-14912

ECONOMIC GROWTH AND ENVIRONMENTAL COSTS,
Coe Coll., Cedar Rapids, Iowa.
J. H. Chapman, Jr.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 231-239.

Descriptors: *Economics, *Environment, *Costs, *Input-output analysis, Income analysis, Employment, Pricing, Water pollution, Air pollution, City planning.
Identifiers: *Boulder (Colo), Space program, Accommodation costs, Removal costs.

A study of the Boulder, Colorado economy (1963-65) was published by the West Virginia University Library. The study, 'The Impact of the Space Program on a Local Economy', was financed by a grant from the National Aeronautics and Space Administration. Its major purpose was to utilize input-output analysis to trace sectorally the total income and employment effects of federally funded space research and production spending by several local establishments such as Ball Brothers and Beech Aircraft. While the Boulder study was commissioned to investigate a particular problem, it is useful for other purposes. The study authors used the study to investigate the impact of the proposed IBM construction of a major production facility near Niwot, Colorado. This input-output analysis could be used to assess costs, direct and indirect, of air pollution and solid waste disposal. Certain problems involved with economic growth are mentioned. There is a problem of external diseconomies of scale which accrue to agglomerates of people. The more people and the more income in any one area, the greater becomes the problem, because dependence on the marketplace to set prices means that costs which never appear there cannot be estimated, e.g., the cost of water pollution. There are accommodation costs and removal costs. The former are the public kinds of costs of accommodating more people with higher incomes. Removal costs have to do with the pervasive growth problems of air and water pollution, where there is an excellent chance to assess the creators the private cost of removing whatever it is that they are dispensing which pollutes. (Strachan-Chicago)
W72-14913

ENVIRONMENTAL PLANNING ALONG MONTANA'S BLUE-RIBBON TROUT STREAMS,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 05G.
W72-14923

LEAD-DEADWOOD SANITARY DISTRICT NUMBER 1, SOUTH DAKOTA (FINAL ENVIRONMENTAL STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 05D.
W72-14924

PROPOSED DIABLO CANYON DESALTING PROJECT (DRAFT ENVIRONMENTAL STATEMENT).
Office of Saline Water, Washington, D.C.; and California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 03A.
W72-14925

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 08D.
W72-14926

ERIE HARBOR, PENNSYLVANIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14927

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AFB FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-14928

WALLISVILLE LAKE, TRINITY RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 08A.
W72-14929

DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-14930

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 08A.
W72-14931

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-14932

LOCAL PROTECTION PROJECT, WATERLOO, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 08D.
W72-14933

TEST TO DETERMINE THE COMBINED EFFECTS OF WAVES AND CURRENTS ON BARRIER MOTIONS AND OIL RETENTION EFFICIENCY IN ROUGH WATER. POINT CONCEPTION, CAL. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-14937

07. RESOURCES DATA

7A. Network Design

URBANIZATION, WATER POLLUTION, AND PUBLIC POLICY,
Barnard Coll., New York.
For primary bibliographic entry see Field 05G.
W72-14437

ADAIR IHD EXPERIMENTAL BASIN NO 14, 1970.
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 04A.
W72-14729

7B. Data Acquisition

WATER FEATURES ON TOPOGRAPHIC MAPS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14211

GROUND-WATER FLOW,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 02F.
W72-14248

A REAPPRAISAL OF NEEDHAM AND USINGER'S DATA ON THE VARIABILITY OF A STREAM FAUNA WHEN SAMPLED WITH A SURBER SAMPLER,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
F. M. Chutter.
Limnology and Oceanography, Vol 17, No 1, p 139-141, January 1972. 3 tab, 9 ref.

Descriptors: *Statistical methods, *Sampling, *Aquatic animals, Mathematical studies, Streams, Variability, Estimating.
Identifiers: *Counting, Analysis of variance, Surber sampler, Variance ratios, Data analysis, Reliability.

In 1956, Needham and Usinger reported on the collection of 100 faunal samples using a Surber square foot sampler to determine the variability of results. In that study, they concluded that 73 samples would be necessary to give significant figures on total numbers at a 95 percent level of confidence. Data are presented here to show that this conclusion, which has made a major impact on limnology, is erroneous. It is concluded that 448 samples are required to give a sample mean within 5 percent of the population at a 95 percent confidence level. Data from sampling sites where the sampling apparatus is totally submerged are particularly variable. (Mortland-Battelle)
W72-14296

A SIMPLE MICROLAYER METHOD FOR SMALL SAMPLES,
Makapuu Oceanic Center, Waimanalo, Hawaii. Marine Ecology Div.
G. W. Harvey, and L. A. Burzell.
Limnology and Oceanography, Vol 17, No 1, p 156-160, January 1972. 1 fig, 1 tab, 2 ref.

Descriptors: *Sampling, *Equipment, *Thin films, Chlorophyll, Fluorometry, Evaluation, Organic matter, Diatoms, Protozoa, Detritus, Methodology.
Identifiers: Spectrofluorimetry, Tryptophan, Tyrosine, Chlorophyll a, Flagellates.

A simple method for the collection of surface microlayer samples involves the immersion of a clean hydrophilic surface in the water and withdrawing it vertically at a controlled rate so that a layer approximately 60-100 microns thick is retained. The surface film and water layer adhering to the plate are removed from both sides with a neoprene windshield wiper blade. This method was found ineffective with layers of oil significantly thicker than monolayers. When the method was tested against a standard microlayer sampling method, the data obtained indicated fairly good agreement between the 2 microlayer methods. (Snyder-Battelle)
W72-14297

AN APPARATUS FOR DOSING LABORATORY FERMENTERS WITH SUSPENSIONS,
West of Scotland Agricultural Coll., Auchincruive (Scotland). Dept. of Bacteriology.
For primary bibliographic entry see Field 05A.
W72-14309

QUARTZ CRYSTALS AS MULTIPURPOSE OCEANOGRAPHIC SENSORS - I. PRESSURE,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
J. D. Irish, and F. E. Snodgrass.
Deep-Sea Research, Vol 19, No 2, p 165-169, February 1972. 4 fig, 2 tab, 6 ref.

Descriptors: *Pressure measuring instruments, *Quartz, *Crystals, *Waves (Water), Oceanography, Aquatic drift, Pressure, Temperature, Sea water, Measurement, Instrumentation, Vibrations.
Identifiers: Sensors.

The use of quartz crystals as pressure sensors in oceanographic studies is considered. A Hewlett Packard Sonde was used which utilizes a crystal disc resonating torsionally near 5 MHz at the center of an evacuated quartz cylinder. This cylinder transfers fluid pressure to radial forces on the disc thus increasing its resonance frequency. A reference crystal is used to heterodyne the sensing crystal signal and obtain a frequency below 100 KHz. The instrument was evaluated for 92 hr on the sea floor off San Clemente Island, California. After initial equalization, the Sonde drift rate was less than 1 cm of seawater pressure per day and appeared to diminish with time. The noise level decreased from 0.1 sq cm per cph at 0.1 cph to less than 0.0001 sq cm per cph at 10 cph. This noise spectrum was sufficiently low so that the instrument could measure ocean waves of 1 mm of period 1 h. (See also W72-14331) (Mortland-Battelle)
W72-14330

QUARTZ CRYSTALS AS MULTIPURPOSE OCEANOGRAPHIC SENSORS - II. SPEED,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
F. J. Resch, and J. D. Irish.
Deep Sea Research, Vol 19, No 2, p 171-178, February 1972. 7 fig, 2 tab, 14 ref.

Descriptors: *Quartz, *Crystals, *Currents (Water), *Measurement, Oceanography, Convection, Instrumentation, Temperature, Sea water, Telemetry, On-site data collections, Velocity.
Identifiers: Sensors.

An indirectly heated speed sensor, utilizing temperature-sensitive quartz crystals, is evaluated for measuring deep-sea currents. In this instrument, a quartz crystal is mounted in a pressure case at the end of a tube. Speed sensors behind this tube contain two additional quartz crystals mounted on the ends of bent tubes in a configuration so that their ends face each other. One of these is heated, the other is not and measures the ambient temperature. The heated crystal then measures the increase above ambient temperature of the heated element, which is a function of the current magnitude. The sensor is used to measure horizontal currents perpendicular to the two sensing elements. The instrument is shown in tests to be capable of measuring currents well below 1 cm per second and is particularly well adapted for deep-sea tidal measurements. (See also W72-14330) (Mortland-Battelle)
W72-14331

THE CALIBRATION OF THERMISTORS OVER THE TEMPERATURE RANGE 0-30 DEGREES C,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
A. S. Bennett.
Deep-Sea Research, Vol 19, No 2, p 157-163, February 1972. 5 fig, 2 tab, 5 ref.

Descriptors: *Instrumentation, *Calibrations, Mathematics, Equations, Measurement, Least squares method, Thermometers, Water temperature, Hydrostatic pressure, On-site investigations.
Identifiers: *Thermistors, Sensors.

A thermistor suitable for long-term temperature recording in the ocean was calibrated to IPTS-68 standards and recalibrated day to day using a triple-point-of-water apparatus. A constant temperature bath was used for the temperature calibrations, with resistance measurements having been obtained with a pair of a. c. Kelvin bridges at 159 Hz. The measured thermistor resistances were corrected for the heating effect of the measuring current by extrapolation of measurements at different currents. The thermistor resistance-temperature relationship can be determined with an accuracy of 0.001C over the range of 0-30C by a formula with four parameters. One of the four parameters may be taken as constant for a particular type of thermistor leaving only three parameters to be obtained by individual calibration. For reduced accuracy or over a narrower temperature span, only two parameters need to be obtained by individual calibration. If rapidly drifting thermistors are eliminated, the mean value of the root mean square drift rate of the remainder is likely to be below the square root of 0.00175 C/yr for the type of thermistor used in these tests. The steel probe provides adequate protection against ambient pressure. This type of thermistor is thus suitable for long-term temperature recording in the ocean. The effect of pressure on the steel probe type of thermistor is .0013 plus or minus .0015 nano (standard deviation) degrees C/bar at pressures up to 700 bar (10,000 psi). (Snyder-Battelle)
W72-14332

INSTRUMENTATION FOR OCEANOGRAPHIC RESEARCH,
E. G. Cromer.
Electronics Instrumentation Digest, Vol 8, No 4, p 9-19, April 1972. 1 tab.

Descriptors: *Instrumentation, *On-site data collections, *Oceans, *Electronic equipment, Computers, Oceanography, Data transmission, Data collections, Automation, Durability, On-site investigations, Hydrologic data, Physicochemical properties, Physical properties, Water pollution control, Hydrography, Salinity, Turbidity, Dissolved oxygen, Hydrogen ion concentration, Pollutant identification, Velocity, Water pressure, Depth, Conductivity, Turbulence, Waves (Water), Tidal waters, Atmospheric pressure, Dew point, Estuaries, Measurement, Water temperature, Ocean currents, Currents (Water), Wind velocity, Precipitation (Atmospheric), Magnetic studies, Ocean waves, Air temperature, Sounding.
Identifiers: Sensors, Transparency, Visibility, Magnetic field.

Oceanographic research has begun to use electronic instruments for measuring a large number of parameters. The use of such instruments makes it possible to gather large amounts of data on a global basis. Formerly, in the interest of accuracy, most data were recorded within instrument packages or sensors and were available only after the package had been brought back to the surface. Modern electronic techniques make it possible to provide signal-conditioning circuitry right at the transducer location, and the signals can be converted into forms that can be transmitted to a central data-acquisition facility with no loss in accuracy. One of the outstanding problems facing oceanographers today is that of obtaining equipment that is suited to - if not designed for the marine environment. Instruments that need perform only in the relative serenity of shipboard environment must be capable of taking line voltage variations of as much as plus or minus 20 V, and frequency variations as great as plus or minus 3Hz in stride without hiccuping. They may also have to tolerate voltage spikes of 40 V or more, without suffering any ill effects. Temperature and humidity extremes, as well as salt atmosphere, pose further survival problems. Even when instruments can be confined to air-conditioned quarters, they must still manage to survive continuous vibration- and low-frequency vibration, in particular. Some of the oceanographic programs in progress include (1) marine charting, (2) estuarine pollution-measurement/control, (3) data buoy program, (4) FLARE project, and (5) naval oceanographic research. In order to obtain the massive amounts of data necessary to understand the earth's oceans, a pragmatic approach in building reliable instruments has been suggested. (Long-Battelle)
W72-14340

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION,
Transportation Systems Center, Cambridge, Mass.
J. R. Lifsitz, and H. C. Ingrao.
Available from NTIS, Springfield, Va. 22151, as PB-204 805; Price $3.00 paper copy; 95 cents microfiche. Department of Transportation, U.S. Coast Guard, Report No. DOT-TSC-CG-71-3, June 1971. 125 p, 34 fig, 4 tab, 26 ref.

Descriptors: *Remote sensing, *Infrared radiation, *Fog, Tracking techniques, Meteorology, Weather, Coasts, Methodology, Costs, Instrumentation, Data collections, Analytical techniques.
Identifiers: *Laser backscattering, *Fog bank detection.

The feasibility of laser backscattering (LIDAR) and infrared radiometry is explored in the detection of coastal fog banks by remote sensing methods. These techniques are analyzed theoretically, and experimental data are presented supporting the analysis. A design study is carried out for several laser systems, considering safety, reliability, cost, convenience, efficiency and maximum range. A fog bank detector utilizing a GaAs laser array is described which best satisfies these criteria. Before the prototype design is selected, a brief in situ test program is recommended. (Woodard-USGS)
W72-14372

MAN-MADE ENVIRONMENT AS VIEWED FROM SPACE: WATER AND AIR POLLUTION,
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 05B.
W72-14373

THERMAL DISCHARGE: A MODEL-PROTOTYPE COMPARISON,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 05B.
W72-14393

EVALUATION OF LIMESTONE FORMATION CHARACTERISTICS FROM WELL LOGS,
Qater Petroleum Co. Ltd., Umm Said.
For primary bibliographic entry see Field 04B.
W72-14491

A PRELIMINARY INVESTIGATION OF TERRESTRIAL AND LOW ALTITUDE AERIAL INFRARED PHOTOGRAPHY AS AN AID IN DETERMINING WATER TABLE DEPTHS AND BURIED GEOLOGICAL STRUCTURES IN THE PIERRE SHALE IN WESTERN SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City.
E. R. Hoskins, D. W. Hammerquist, and P. H. Rahn.
Available from the National Technical Information Service as PB-206 494, $3.00 in paper copy, $0.95 in microfiche. South Dakota School of Mines and Technology Final Report on HP 5806 (5115) P, June 1971. 59 p, 43 fig, 3 ref.

Descriptors: *Geology, *Groundwater, *Hydrologic data, *Aerial photography, *South Dakota, Remote sensing, Photogrammetry, Terrain analysis, Subsurface investigations, Faults (Geologic), Fracture permeability, Aquifers, Water tables, Analytical techniques, Photography.
Identifiers: Infrared film, Road cuts.

Faults and joints and water table depths in road cuts in the Pierre shale were investigated from terrestrial and low altitude aerial photographs. Over 1200 photographs were taken during the project. Three sites on Interstate 90 east of Rapid City received repeated monthly multispectral photographic coverage for about one year. Black and white panchromatic, natural color, and infrared color films were used. The negatives and transparencies were enlarged and printed on both color and black and white paper with various filters on the enlarger to enhance the data presentation. Small faults and joints previously correlated with pavement distress were identifiable from nearly all of the combinations of films and filters and printing techniques. The most useful and easiest to interpret display of information was from the low altitude (500 to 1000 feet above the ground) aerial color infrared photographs printed in color. (Woodard-USGS)
W72-14527

REMOTE SENSING OF SEA SURFACE TEMPERATURE FROM EARTH SATELLITES,
Natioanl Oceanic and Atmospheric Administration, Rockville, Md.
P. K. Rao.
Available from Sup Doc, GPO, Washington, DC 20402, Price $5.25. In: Proceedings of the International Workshop on Earth Resources Survey Systems, Washington, D C, May 13-14, 1971, Vol II, p 595-606, 1971 (release date). 6 fig, 6 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Water temperature, *Infrared radiation, Computer programs, Data processing, Data collections, Sea water.

By using earth orbiting satellites containing radiometers, it is possible to measure sea surface temperature under relatively clear sky conditions. The mapping of sea surface temperature from satellite IR observations requires the capability to discriminate the Earth's surface from cloud. To overcome this problem, a method was developed to examine a large number of measurements within an area larger than that covered by most cloud masses. From such a sample of measurements, the surface temperature can be found by making use of the following: (a) the magnitude of the temperature should be highest for the cloud-free observations; and (b) modes dominated by relatively cloudfree observations will be distinct. (Knapp-USGS)
W72-14531

PROSPECTING OF UNDERGROUND WATER BY THE MEASUREMENT OF NATURAL RADIOACTIVITY,
National Research Institute of Agricultural Engineering, Hiratsuka (Japan).
For primary bibliographic entry see Field 02F.
W72-14600

A STUDY OF THE RELATIONSHIP BETWEEN THE GEOPHYSICAL P.D.R. (POTENTIAL DROP RATIO) RESISTIVITY MEASUREMENTS AND THE COEFFICIENT OF TRANSMISSIBILITY (T) OF THE AQUIFERS,
State Hydraulic Works, Ankara (Turkey). Groundwater Div.
For primary bibliographic entry see Field 02F.
W72-14607

THE FRAUNHOFER LINE DISCRIMINATOR: AN AIRBORNE FLUOROMETER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14613

THE USE OF PHOTOGRAPHY IN WATER QUALITY RESEARCH,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05A.
W72-14728

DETERMINATION OF SOIL MOISTURE CONTENT WITH AIRBORNE MICROWAVE RADIOMETRY,
Aerojet-General Corp., El Monte, Calif. Microwave Div.
For primary bibliographic entry see Field 02G.
W72-14748

AN IMPROVED SEPARATION AND DETERMINATION OF URANIUM IN SEAWATER,
Hawaii Univ., Honolulu. Dept. of Chemistry; and Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 05A.
W72-14798

A NOTE ON THE MEASUREMENT AND ESTIMATION OF EVAPORATION,
For primary bibliographic entry see Field 02D.
W72-14879

MODIFICATIONS OF SHIELDED NET RADIOMETERS TO MEASURE SOLAR RADIATION PROFILES IN WATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso.
Limnology and Oceanography, Vol 17, No 3, p 462-466, May 1972. 3 fig, 1 tab, 12 ref.

Descriptors: *Solar radiation, *Underwater, *Instruments, *Calibrations, *Thermal radiation, Light, Adsorption, Energy, Thermal properties, Temperature.
Identifiers: *Radiometers.

Five modifications of polyethylene-shielded net radiometers were developed and tested for use in determining both downwelling and upwelling radiation underwater. A field trial of the instruments yielded a logarithmic extinction relation in very turbid water, with the upwelling radiation equal to about 2.2% of the downwelling radiation at any level. (Knapp-USGS)
W72-14962

7C. Evaluation, Processing and Publication

WATER FEATURES ON TOPOGRAPHIC MAPS,
Geological Survey, Washington, D.C.
M. M. Thompson.
ASCE Proceedings, Journal of the Surveying and Mapping Division, Vol 98, No SU1, Paper 9018, p 1-16, July 1972. 18 fig.

Descriptors: *Mapping, *Maps, *Remote sensing, *Photogrammetry, *Hydrologic data, Data collections, Topographic mapping, Terrain, Hydrography, Surveys, Water resources.

Topographic maps are a prime source of information for planning the improvement of man's environment with respect to water. In order to utilize the tremendous amount of hydrologic information shown on these maps, the water resources planner must know what maps are available and how to interpret the map portrayal of water features. This paper explains how various features are shown and how to interpret features that are subject to change because of seasonal conditions, construction of dams, reclamation of swamps, and changes in stream courses. The classes of water features discussed include streams, lakes, ponds, reservoirs, canals, aqueducts, ditches, springs, wells, glaciers, and coasts. Methods of improving the hydrologic information on maps are considered, with specific reference to orthophotomaps. Applications of special types of photography such as color infrared, and the use of orbiting satellites as vehicles for sophisticated sensors are mentioned. (Knapp-USGS)
W72-14211

DIGEST OF THE CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
F. H. Pauszek.
Geological Survey Open-file Report, 1971. 66 p, 17 fig, 17 tab.

Descriptors: *Hydrologic data, *Data collections, *Federal Government, *Indexing, Reviews, Water quality, Surface waters, Groundwater, Streamflow, Information retrieval, Gaging stations, Sampling, Sites.
Identifiers: *Catalog (Water data).

The Catalog of Information on Water Data is a file of information about water-data acquisition activities, maintained in accordance with the directions set forth in Circular A-67, issued by the Office of Management and Budget. This Circular calls upon the U.S. Department of the Interior to coordinate certain water-data acquisition activities conducted by Federal agencies on streams, lakes, reservoirs, estuaries, and groundwaters. This report is a digest of information appearing in the 1970 edition of the Catalog. It also includes information on active groundwater stations reported in the 1968 edition of the Catalog. The digest highlights some of the Catalog information by means of illustrations and tables; a brief explanation precedes each. Items covered are who is reporting, what is reported, the scope of activities, and the periods of record. (Woodard-USGS)
W72-14234

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1971,
Geological Survey Helena, Mont.
M. V. Johnson, and R. J. Omang.
Available from NTIS, Springfield, Va 22151 PB-208 079 Price $3.00 paper copy; 95 cents microfiche. Geological Survey Open-file Report, March 1972. 140 p, 1 fig.

Descriptors: *Streamflow, *Peak discharge, *Flood forecasting, *Small watersheds, *Montana, Stream gages, Gaging stations, Crest-stage gages, Hydrologic data, Basic data collections, Reviews.

A program to investigate the magnitude and frequency of floods from small drainage areas in Montana was begun July 1, 1955. Originally, 45 crest-stage gaging stations were established. In September 1971 there were 182 stations. The annual peak stage and discharge at each crest-stage gaging station are tabulated by water year. Also, the activities and progress made during the 1971 water year are summarized. The purpose of the program is to define the magnitude and frequency of floods, on a regional basis, for Montana. Hydrologic data on small drainage areas are collected to supplement data obtained from the established stream-gaging program of the Geological Survey. (Woodard-USGS)
W72-14235

POTOMAC RIVER WATER QUALITY NETWORK: COMPILATION OF DATA.
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 05A.

W72-14281

BAYESIAN OPTIMIZATION IN SAMPLING FINITE POPULATIONS,
Manitoba Univ., Winnipeg. Dept. of Actuarial Mathematics and Statistics.
J. N. K. Rao, and P. D. Ghangurde.
Journal of the American Statistical Association, Vol 57, No 338, p 439-443, June 1972.

Descriptors: *Sampling, *Population, *Finite element analysis, Mathematical studies, Algorithm, Data collections, Methodology, Statistical methods, Variability, Size, Optimization.
Identifiers: *Bayesian optimization, Random sampling.

The problem of optimum allocation in sampling finite populations using prior information is considered. The following cases are investigated: (1) stratified simple random sampling with known strata sizes; (2) Neyman's double sampling with unknown strata sizes; (3) the Hansen-Hurwitz method for the non-response problem; (4) two-stage random sampling. The optimum allocation in each case is obtained by minimizing the expected posterior variance of the mean subject to constraints. The results are extended to multiple prior distributions and/or multiple characters. The solutions are distribution-free and also free from the assumption of infinite populations and/or known variances. Attention is given to 'data-based' prior distributions. (Long-Battelle)
W72-14341

PARTIALLY BALANCED DESIGNS FOR HALF SAMPLE REPLICATION METHOD OF VARIANCE ESTIMATION,
Malaya Univ., Kuala Lumpur (Malaysia). Faculty of Economics and Administration.
K-H. Lee.
Journal of the American Statistical Association, Vol 67, No 338, p 324-334, June 1972. 10 tab, 15 ref.

Descriptors: *Methodology, *Design, *Variability, *Estimating, Mathematical studies, Statistical models, Sampling, Data collections, Population, Regression analysis, Efficiencies.
Identifiers: Replication, Precision, Performance evaluation.

Half sample replication has been used as a method for estimating variances in stratified sampling whereby two primary selections are drawn from each stratum. This article considers some procedures of improving the precision of the variance estimator computed from a partially balanced set of half samples. Both the theoretical and empirical findings suggest that the SAOA procedure is an effective method to employ, in particular with a '2-order partially balanced design'. (Long-Battelle)
W72-14342

ESTIMATING ERRORS IN EXPERIMENTAL DATA,
Atomic Energy of Canada Ltd., Chalk River (Ontario).
J. M. Blair.
Instruments and Control Systems, Vol 45, No 5, p 95-97, May 1972. 4 tab, 2 ref.

Descriptors: *Statistical methods, *Numerical analysis, *Estimating, Mathematical studies, Finite element analysis, Variability.
Identifiers: *Experimental error, Errors, Analysis of variance, Data analysis, Confidence limit.

A numerical technique based on finite differences for estimating errors in experimental data is presented. Finite differences for five experimental points are formed in a finite difference table using given nomenclature. Tables are also given for finite differences for an experimental function, for differences consisting of error terms only, for confidence limits, and for normalized estimates of variance. An example is presented to illustrate the technique. (Mortland-Battelle)
W72-14343

LIKELIHOOD ANALYSIS OF THREE-WAY CONTINGENCY TABLES,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
J. K. Lindsey, and F. W. Nash.
Journal Fisheries Research Board of Canada, Vol 29, No 5, p 590-591, May 1972. 1 ref.

Descriptors: *Statistical methods, *Mathematical studies, *Distribution patterns, Sampling, Analytical techniques, Benthos, Fish, Computer programs.
Identifiers: *Three way contingency tables, Contingency tables, Analysis of variance, Variance ratios, Multinomial distribution, Counting.

The three-way contingency table is considered as an analysis of variance problem. Since the appropriate distribution is multinomial rather than normal, the log likelihood ratios are used to make inferences instead of the variance ratios. Two specific examples of such an analysis are cited. In one, three methods of sampling organisms on the bottom of a stream were compared. In the second, an analysis was run to determine if length-age frequency tables for a given species of fish for a number of samples taken in 1 week could be combined. An IBM computer program for the analysis discussed is available. (Mortland-Battelle)
W72-14346

OPTIMUM RESERVOIR OPERATION USING STOCHASTIC DYNAMIC PROGRAMMING,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 04A.
W72-14347

SUBSURFACE WATER TEMPERATURES OF THE COLUMBIA RIVER AT PRESCOTT, OREGON (RIVER MILE 72), 1968-69,
National Marine Fisheries Service, Seattle, Wash. Biological Lab.
For primary bibliographic entry see Field 05G.
W72-14357

RESEARCH IN NUMERICAL ANALYSIS TECHNIQUES FOR MODEL SIMULATION,
Digital Programming Services, Inc., Waltham, Mass.
For primary bibliographic entry see Field 02B.
W72-14358

FIELD OBSERVATIONS OF WAVE RUNOFF ON A SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
M. J. Hoernemann.
Available from NTIS, Springfield, Va. 22151 as AD-821 832. Price $3.00 paper copy, 95 cents microfiche. M Sc Thesis in Oceanography, June 1967. 90 p, 10 fig, 7 tab, 11 ref, append.

Descriptors: *Ocean waves, *Beaches, *Surf, *Waves (Water), *Velocity, Time, Winds, On-site data collections, Travel time, Measurement, Sea spray, Wave pile-up, Analytical techniques, Correlation analysis, Properties.
Identifiers: Wave runup, Swell, Offshore waves.

Six sets of field measurements of runup resulting from both wind waves and swell were made on a uniform sand beach. Waves were recorded simultaneously directly offshore at a point outside the surf zone. Each individual runup was correlated with a specific wave, using a traveltime plot. Runup occurrences were always found to be fewer in number than wave occurrences, particularly when wind waves were present. There were variations in the runup resulting from waves of a given height. These variations inheight and ratio of runup to waves were caused in large part by the interaction of successive foam lines. Interaction occurred in the form of retardation by backwash of preceding waves, overtaking by a following foam line, and overriding by a small unbroken wave. The complicated nature of runup resulting from ordinary sea and swell makes it difficult to predict runup accurately from laboratory studies. (Woodard-USGS)
W72-14362

A SUMMARY OF PEAK STAGES AND DISHCARGE IN MARYLAND, DELAWARE, AND DISTRICT OF COLUMBIA FOR FLOOD OF JUNE 1972,
Geological Survey, Parkville, Md.
K. R. Taylor.
Geological Survey Open-file Report, 1972. 13 p, 1 tab, 3 fig.

Descriptors: *Floods, *Peak discharge, *Streamflow, *Maryland, *Storms, Hydrologic data, Basic data collections, Gaging stations, Stream gages, Discharge measurement, Correlation analysis, Variability, Historic floods, *Delaware, *District of Columbia.
Identifiers: *Tropical storm Agnes (Md June 1972).

Intense rainfall associated with tropical storm Agnes caused devastating flooding in several states along the Atlantic Seabord during late June 1972. Peak discharges at many gaging stations on streams and rivers in central Maryland, northern Delaware, and the District of Columbia far exceeded the previous maximum flows recorded at these stations. Record peak flows in Maryland occurred on long-term stations (more than 20 years of record) as far west as Conococheague Creek in Washington County and as far east as Morgan Creek in Kent County. Five stations with more than 20 years of record had peak flows that were more than 4 times greater than previously recorded peaks. Western Run at Western Run and North Branch Patapsco River at Cedarhurst had peak flows that were 6 1/2 times greater than any previous peak flow during more than 25 years of record. Peak stages at these stations exceeded the previous record stages by 15.2 feet and 10.4 feet, respectively. At Conococheague Creek at Fairview and Monocacy River at Jug Bridge near Frederick peak flows exceeded the record 1889 peak flows by nearly 50 percent. (Woodard-USGS)
W72-14369

OPTIMUM OPERATIONS MODEL FOR SHASTA-TRINITY SYSTEM,
Bureau of Reclamation, Sacramento, Calif. Water and Power Control Division.
For primary bibliographic entry see Field 04A.
W72-14384

RIVER DEE RESEARCH PROGRAM: 3. A SHORT-TERM CONTROL STRATEGY FOR MULTIPURPOSE RESERVOIR SYSTEMS,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14388

VERMONT WATER QUALITY SIMULATION PROJECT REPORT,
Thayer School of Engineering, Hanover, N.H.
For primary bibliographic entry see Field 05B.
W72-14392

COMPUTER MODEL FOR A THERMAL PLUME,
Detroit Edison Co., Mich.

For primary bibliographic entry see Field 05B.
W72-14407

QUALITY OF SURFACE WATER IN THE BEAR RIVER BASIN, UTAH, WYOMING, AND IDAHO,
Geological Survey, Washington, D.C.
K. M. Waddell, and D. Price.
Available from USGS; Washington, DC 20242- Price $1.50 per set. Geological Survey Hydrologic Investigations Atlas HA-417, 1972. 2 sheets, 14 fig, 2 map, 4 tab, 26 ref.

Descriptors: *Water quality, *Surface waters, *Utah, *Wyoming, *Idaho, Hydrologic data, Data collections, River basins, Streamflow, Water sampling, Water analysis, Water properties, Water types, Chemical analysis, Water resources development, Hydrology, Rainfall, Snowmelt, Runoff, Flow characteristics.
Identifiers: *Bear River Basin (Utah, Wyo, and Idaho).

The U.S. Geological Survey, in cooperation with the Utah Department of Natural Resources, Division of Water Rights, began a reconnaissance in 1967 to obtain essential water-quality information for the Bear River basin in Utah, Wyoming, and Idaho. Water samples were obtained at most sites in a selected network four times during an 11-month period (September 1967-July 1968) to define chemical-quality conditions during low flow in the winter, high runoff (snowmelt period) in the spring, midirrigation period in the summer, and postirrigation period in the fall. Each of the four sets of data was obtained within a 5-day period to establish a concurrent, basinwide, seasonal pattern of chemical quality. Sediment data were collected during the snowmelt period in the spring. The reconnaissance data and selected miscellaneous data collected earlier are the basis for this 2-sheet atlas. Maps, curves, tables, and photographs describe the hydrologic data. The water on the tributaries was predominantly of the calcium bicarbonate type, and the concentration of dissolved solids ranged from 100 to 500 mg/liter. (Woodard-USGS)
W72-14539

WATER RESOURCES OF NORTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
R. H. Pearl, R. S. Roberts, K. M. Keene, and T. J. McClain.
Available from USGS, Washington, DC 20242- Price $1.00 per set. Geological Survey Hydrologic Investigations Atlas HA-429, 2 sheets, 1972. 5 fig, 5 map, 1 tab, 16 ref.

Descriptors: Water resources development, *Groundwater resources, *Surface waters, *Hydrologic data, *Kansas, Aquifer characteristics, Water wells, Water yield, Water quality, Groundwater recharge, Pumping, Drawdown, Transmissivity, Storage coefficient, Streamflow, Runoff, Maps, Curves, Water utilization, Irrigation, Livestock, Domestic water.
Identifiers: Hydrologic atlas.

This 2-sheet atlas presents information on geology and water resources of a six-county area in northwestern Kansas. The data are intended primarily as a guide to the availability of groundwater, which is the main source of supply for domestic, stock, industrial, irrigation, and municipal uses. The principal water-bearing formation is the Ogallala Formation. The Ogallala aquifer has a saturated thickness of as much as 270 feet and yields as much as 2,000 gpm. Transmissivities of the Ogallala range from 10,000 to 130,000 gpd per foot and specific capacities of wells range from less than 10 to about 60 gpm per foot of drawdown. The South Fork of the Republican River, which is affected by irrigation diversions and by storage in Bonny Reservoir, and the Arikaree River are the only perennial streams in the western part of the area. The combined annual streamflow from the area is about 170,000. Concentrations of dissolved solids in the groundwater samples from the Ogallala Formation range from 206 to 591 mg/liter (milligrams per liter). The water is suitable for domestic, stock, and irrigation purposes and meets all standards of chemical characteristics, except hardness, recommended by the U.S. Public Health Service. (Woodard-USGS)
W72-14540

SOIL SURVEY OF TUCSON-AVRA VALLEY AREA, ARIZONA,
Soil Conservation Service, Tucson, Ariz.
For primary bibliographic entry see Field 02G.
W72-14576

GENERAL SOIL MAP LOWER PANTANO WASH AREA, PIMA COUNTY, ARIZONA - A SPECIAL REPORT WITH SELECTED ENGINEERING INTERPRETATIONS,
Soil Conservation Service, Portland, Oreg.
M. L. Richardson.
June 1972. 28 p, 3 tab, 2 map.

Descriptors: *Soil surveys, *Land use, *Arizona, *Remote sensing, *Environmental engineering, Surveys, Hydrologic aspects, Mapping, Southwest U.S., Drainage area, Soil properties, Soil types.
Identifiers: *Pantano Wash area (Ariz).

The purpose of the survey produced in cooperation with Office of Arid Lands Studies, University of Arizona, was to determine the distribution and characteristics of the major soils in the area, using standard methods, and comparing their distribution to the pattern depicted on high altitude, small scale color photographs. Information so obtained is intended to provide basic guidance for future land use planning along Pantano Wash with consideration being given to soil and hydrological limitations, together with esthetic factors as determined from high altitude and space photography. Seven mapping units, comprising 6 soil associations, are delineated on a 2-inch=1 mile half-tone aerial photo mosaic, and contain information on such properties as texture, slope, depth, carbonate content, rock fragment content, and natural drainage. The geology, hydrology, climate, and general description of the area are stated. Estimated soil properties significant to engineering interpretations for residential, industrial, and recreational used are displayed in tabular form, as well as soil limitations ratings, and features affecting engineering interpretations. A glossary is appended. (Paylore-Arizona)
W72-14578

ON HYDROGEOLOGY AND GROUNDWATER WELLS OF ETHIOPIA,
Ministry of Public Water Works, Addis Ababa, (Ethiopia). Water Resources Dept.
For primary bibliographic entry see Field 04B.
W72-14591

GROUNDWATER BASIN TYPES IN TURKEY,
State Hydraulic Works, Ankara (Turkey). Groundwater Div.
For primary bibliographic entry see Field 02F.
W72-14592

THE HYDROGEOLOGY OF THE ANSEONG RIVER BASIN, KOREA,
Geological Survey of Korea, Seoul.
For primary bibliographic entry see Field 02F.
W72-14594

APPLICATION OF THE WATER BALANCE SIMULATION FOR PREDICTING LAND SUBSIDENCE--A DIGITAL COMPUTER APPROACH,
For primary bibliographic entry see Field 02F.
W72-14604

WATER RESOURCES DATA FOR NEW YORK, 1971: PART 1. SURFACE-WATER RECORDS.
Geological Survey, Albany, N.Y. Water Resources Div.

Geological Survey Basic Data Report, 1972. 311 p, 14 fig, 3 ref.

Descriptors: *Surface waters, *Water resources, *Basic data collections, *Hydrologic data, *New York, Streamflow, Flow rates, Low flow, Peak discharge, Average flow, Lakes, Reservoirs, Gaging stations, Reservoir storage, Water levels, Water yield, Discharge measurement, Crest-stage gages.

Surface-water records for the 1971 water year (October 1, 1970-September 30, 1971) for New York are given, including records of streamflow, reservoir storage or lake elevations at gaging stations, partial record stations, and miscellaneous sites. Records for a few pertinent gaging stations in bordering states are also included. The data include daily discharge records for 204 gaging stations; daily or monthly stage or contents for 45 lakes and reservoirs; discharge measurements for 509 sites, 163 of which are low-flow partial-record stations and the remainder, miscellaneous sites; and annual maximum stages and discharges for 106 crest-stage partial-record stations. (Woodard-USGS)
W72-14609

MODELS FOR THE SYNTHESIS OF MONTHLY STREAMFLOWS FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 02E.
W72-14640

SPACE-TIME ANALYSIS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W72-14643

THE PRACTICAL APPLICATION OF DYNAMIC PROGRAMMING TO RESERVOIR SYSTEMS WITH PUMPED INPUTS,
Water Research Association, Medmenham (England).
For primary bibliographic entry see Field 04A.
W72-14646

THE ECONOMICS AND USE OF LARGE SCALE ELECTRODIALYSIS PLANTS ON SELECTED TIDAL ESTUARIAL WATERS,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 03A.
W72-14648

THE CONTRIBUTION OF GLACIER ICE TO THE WORLD WATER BALANCE (A STATUS REPORT ON THE WORLD GLACIER INVENTORY),
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 02C.
W72-14715

EVALUATION OF THE STREAMFLOW-DATA PROGRAM IN HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02E.
W72-14737

GROUND-WATER CONDITIONS IN THE EAST SHORE AREA, BOX ELDER, DAVIS, AND WEBER COUNTIES, UTAH-1960-69,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14742

WATER RESOURCES OF THE CROW WING RIVER WATERSHED, CENTRAL MINNESOTA,
Geological Survey, Washington, D.C.
G. F. Lindholm, E. L. Oakes, D. W. Ericson, and J. O. Helgesen.
Available from USGS, Washington, DC 20242 - Price $1.75 per set. Geological Survey Hydrologic Investigations Atlas HA-380, 1972. 4 sheets, 24 fig, 4 tab.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Minnesota, Rainfall-runoff relationships, Water yield, Water utilization, Water quality, Streamflow, Groundwater movement, Evaporation, Evapotranspiration, Water balance, Hydrologic cycle, Hydrologic data, Maps, Curves.
Identifiers: *Crow Wing River Watershed (Minn).

This 4-sheet hydrologic atlas uses approximately 40 illustrations (maps, curves, and tables) in describing water resources of the Crow River Watershed in Central Minnesota. On a long-term basis, about 22 inches of the 26 inches of annual precipitation in the Crow Wing River Watershed is lost through evaporation and transpiration. The remaining 4 inches leaves the basin as surface runoff. Essentially all water supplies in the watershed are derived from glacial drift aquifers. Adequacy of this source of water generally precludes development of bedrock aquifers. All water in the watershed is of the calcium-bicarbonate type and is very hard. The ground-water quality varies according to source, whereas, in streams, quality of water is fairly uniform when base-flow conditions exist. Flow in the main stem of the Crow Wing River is stable because of the regulating effect of lakes and marshes at medium and high flows and the sustaining effect of groundwater discharge from outwash areas during low-flow periods. (Woodard-USGS)
W72-14743

COMPUTER SIMULATION OF ACTIVATED SLUDGE PLANT OPERATION,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-14850

STOCHASTIC SPACE-TIME MODELS OF THE RAINFALL-RUNOFF PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02A.
W72-14922

08. ENGINEERING WORKS

8A. Structures

EFFECT OF FOUNDATION ELASTICITY ON ARCH DAM DEFLECTIONS AND STRESSES,
Uttar Pradesh Irrigation Research Inst., Roorke (India).
R. S. Varsheny.
Water Power, Vol. 24, No. 3-4, Part I-II, p 95-99, 130-136, Mar-Apr 1972. 12 p, 12 fig, 32 ref.

Descriptors: *Elastic deformation, *Arch dams, *Rock foundations, *Dam foundations, Deformation, Load distribution, Trial-load method, Stress, Strain, Bibliographies, Tensile stress, Foundations, Rock mechanics, Deflection, Hydraulic pressure.
Identifiers: *Thin arch dams, Canyon shape factor, India, Elastic foundations, Modulus of elasticity, Double-curvature arch dams.

Behavioral studies of arch dams under specific site conditions determined the effects of foundation elasticity, canyon shape factor, constant and variable radii, load distribution, radial deflection of the crown cantilever, and vertical stress. Foundation strains are a function of time, direction of applied forces, and presence of joints, faults, and other geological features. After a few loading cycles, deformations of a rocky foundation may be assumed to be elastic. A factor lambda (ratio of dam concrete elasticity to elasticity of foundation rock) is critically analyzed for its bearing on the state of stress in arch dams, and recommendations on the treatment of different values of lambda are made for dams of different thicknesses. Conclusions are: (1) Stresses and deformations in thin arch dams are less susceptible to change of foundation elasticity than in thicker dams; (2) increased deformability decreases vertical tensile stress at the heel crown cantilever and compressive stress at the toe; (3) values of lambda between 2 and 4 are more critical for thick dams, and between 1 and 2 for thin dams; and (4) variable-radius arch dams are more suitable for narrow valleys and less susceptible to change in lambda. (USBR)
W72-14240

SWEETWATER CREEK WATERSHED PROJECT, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-14265

LIBBY DAM AND LAKE KOOCANUSA, KOOTENAI RIVER, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-200 538-D. $3.00 in paper copy. June 7, 1971. 45 p, 4 map, 1 illus, 1 photo, 1 tab.

Descriptors: *Montana, *Columbia River Basin, *Environmental effects, *Multiple-purpose projects, Construction, Hydroelectric plants, Electric power production, Flood control, Flood protection, Flooding, Aesthetics, Wildlife habitats, Fisheries, Impoundments, Reservoir construction, Water pollution sources, Highway relocation, Railroad relocation, Sites, Dam construction.
Identifiers: *Environmental impact statement, *Libby Dam and Lake Koocanusa Project, *Lincoln County (Mont), Population relocation.

The Libby Dam and Lake Koocanusa Project in Lincoln County, Montana, is a multiple-purpose flood control and hydroelectric project in the Columbia River Basin. A lake will be constructed which will have a surface area of 46,500 acres at normal full pool and 4,965,000 acre feet of usable storage. The dam will be 446 feet high and 3,055 feet long and the powerhouse on the west bank will initially house four 105,000 kw generators with provisions for four more. Environmental impacts include: flood protection for a 56 square mile agricultural area; 854,000 kw of additional power for the Pacific Northwest; aesthetic impairment to the woodland setting of the dam; inundation of cultivated and grazing land, forests, residential areas, and national forest land; and relocation of about 300 people. Adverse environmental impacts include alteration of fish and wildlife habitats due to water impoundment and destruction of wildlife winter ranges by inundation and highway relocation. To mitigate habitat losses, 7,000 acres of national forest lands are being improved for use as a habitat. The only alternative other than design change is to abandon the project. Alternative methods of debris disposal and an alternate relocation route for a highway are being considered. (Grant-Florida)
W72-14268

TRUMBULL LAKE, PEQUONNOCK RIVER, TRUMBULL, CONNECTICUT (UPDATED FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-206 104F, $3.00 paper copy. November 22, 1971. 40 p, 6 tab, 1 fig.

Descriptors: *Connecticut, *Multiple-purpose projects, *Dam construction, *Environmental effects, Flood protection, Municipal water, Water supply, Wildlife habitats, Stream fisheries, Aesthetics, Recreation, Aquatic habitats, Water quality control, Reservoir construction, Flooding, Channel improvement.
Identifiers: *Environmental impact statement, *Trumbull Lake (Conn), Pequonnock River (Conn).

The proposed project involves construction of a concrete dam and storage reservoir to provide flood protection, water supply, and water quality control in the Bridgeport, Connecticut area. The proposed site is in a scenic gorge on the Pequonnock River north of Bridgeport. The reservoir will be 2.5 miles long and 220 acres will be cleared for the project. The project will have the following effect on the local environment: inundation of 200 acres with up to 283 acres during the spring flood; improved conditions downstream; reloaction of 25 homes; loss of swimming opportunities; loss of animalhabitats from inundation; and temporary water, air and noise pollution associated with construction. Adverse impacts which cannot be avoided include: inundation of 200 acres of scenic woodland, loss of the aesthetic quality of the steep valley, loss of stream fishery for 2 miles, and interference with existing water recreational facilities. Alternatives considered include: no action; local protection such as dikes, floodwalls, and channel improvement; flood proofing; evacuation of the flood plain; and flood plain zoning. (Grant-Florida)
W72-14278

TRANSPORTABLE BREAKWATERS-A SURVEY OF CONCEPTS,
Naval Civil Engineering Lab., Port Hueneme, Calif.
D. B. Jones.
Available from NTIS, Springfield, Va. 22151, as AD-887 841. Price $3.00 paper copy; 95 cents microfiche. Technical Report R-727, May 1971. 70 p, 10 fig, 4 tab, 97 ref.

Descriptors: *Breakwaters, *Classification, *Reviews, *Hydraulic structures, Engineering structures, Evaluation, Barriers, Retaining walls.
Identifiers: *Transportable breakwaters, Literature survey.

Published and unpublished reports dealing with transportable breakwaters were reviewed to collect performance data for a wide variety of configurations. Data on 106 concepts were assembled into an outline classification of transportable breakwaters on the basis of structural form. The various configurations are shown in sketches and their performance data are summarized. This state-of-the-art survey establishes a data base to aid in assessing the feasibility of developing an effective, mobile system for use in areas fully exposed to ocean waves. (Woodard-USGS)
W72-14361

NATIONAL ENGINEERING HANDBOOK, SECTION 2-ENGINEERING PRACTICE STANDARDS: PART 1, ENGINEERING CONSERVATION PRACTICES.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08D.
W72-14364

TRENDS IN BAFFLED, HYDRAULIC JUMP STILLING BASIN DESIGNS OF THE CORPS OF ENGINEERS SINCE 1947,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14368

COOLING TOWER PLUME RISE,
General Electric Co., Schenectady, N.Y. Energy and Environmental Programs.
For primary bibliographic entry see Field 05G.
W72-14396

CHARACTERISTICS, CLASSIFICATION AND INCIDENCE OF PLUMES FROM LARGE NATURAL-DRAFT COOLING TOWERS,
Metropolitan Edison Co., Reading, Pa. Three Mile Island Nuclear Station.
For primary bibliographic entry see Field 05G.
W72-14397

COOLING WATER STRUCTURES FOR FITZPATRICK NUCLEAR PLANT,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-14403

VULNERABILITY OF THE WATER, SEWAGE, AND DRAINAGE SYSTEMS IN SAN JOSE,
Stanford Research Inst., Menlo Park, Calif.
D. W. Goodrich, E. P. Webster, Jr., C. A. Kamradt, and F. H. Merrick.
Available from the National Technical Information Service as AD-822 205, $3.00 in paper copy, $0.95 in microfiche. Office of Civil Defense, Office of the Secretary of the Army, Washington, D. C., October 1967. 127 p, 11 fig, 21 tab, 59 ref. Army OCD-PS-64-201.

Descriptors: *Civil defense, *Nuclear explosions, *Military aspects, *Water supply, *Sewerage, *Drainage systems, California, Hazards, Assessments, Electric power failure, Facilities, Reliability, Water resources, Water delivery.
Identifiers: *Nuclear attack, *Warfare, *Vulnerability, Emergency measures, San Jose (Calif).

The facilities are examined of the water supply, sewage, and drainage systems in the City of San Jose. Their vulnerability to the effects of nuclear attack postulated for the first iteration of the Five city study is assessed. A preliminary estimate is presented of the postattack capability of these systems and their interaction with the electric power system. Additional data presented are: guides for analyzing the vulnerability of water, sewage, electric power, and natural gas facilities to the effects of a 5-MT nuclear burst; and methods for performing rapid network analysis of water supply systems. The Five City Study includes San Jose, Los Gatos, Monte Sereno, Saratoga and parts of Campbell, Cupertino and Santa Clara. All are in Santa Clara County. The water supply system in San Jose is highly dependent on electric power for well and booster pumping. However, since the San Jose Water Works obtains its water supply from both groundwater and surface water sources, some residual supply capability will exist in the event that the supply of electric power is interrupted. The sewage collection system in San Jose was found to be only slightly dependent upon electric power, since the collection system is predominantly a gravity collection system. No significant damage is expected to occur to the collection system as a result of the attack, and therefore no post-attack problem is expected to hinder the collection of sewage in the City of San Jose. The drainage system in the City of San Jose is essentially 182 separate, predominantly-gravity systems tied together by improved and unimproved natural drainage ways. No significant damage is expected from the attack. (Poertner)
W72-14448

LARGE DIAMETER HOLE DRILLING,
Lauman (C. W.) and Co., Long Island, N.Y.
R. H. Lauman.
Ground Water, Vol 1, No 2, p 9, 10, 14, April, 1963.

Descriptors: *Water wells, *Drilling, New York, *Glacial aquifers, Saline water intrusion, Logging (Recording).
Identifiers: *Well construction, Well development, *Large-diameter wells, Reverse-rotary drilling, Licensing, Underreaming, *Long Island (NY).

The construction features of large diameter wells drilled mostly on Long Island, measuring 24 to 42 inches in diameter, and ranging from 100 to 1,000 feet deep with capacities up to 3,000 gpm are described. (Campbell-NWWA)
W72-14507

PUGET SOUND AND ADJACENT WATERS COMPREHENSIVE PLAN (DRAFT ENVIRONMENTAL STATEMENT).
Pacific Northwest River Basins Commission, Vancouver, Wash.
For primary bibliographic entry see Field 06G.
W72-14558

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-200 941 F. $3.00 in paper copy, $0.95 in microfiche. April 12, 1972. 45 p, 4 plate, 5 tab.

Descriptors: *Kentucky, *Dam construction, *Multiple-purpose projects, *Environmental effects, Flood control, Water quality control, Watersheds (Basins), Wildlife habitats, Reservoirs, Lake fisheries, Aesthetics, Turbidity, Sedimentation, Water resources development, Relocation, Appalachian Mountain Region, Recreation, Recreation demand, Economic impact.
Identifiers: *Environmental impact statements, *Yatesville Lake (Ky), *Big Sandy River Basin (Ky).

The project involves construction of a dam and other facilities for recreation, flood control, and water quality control on Blaine Creek, 18.1 miles above its confluence with Big Sandy River in the Appalachian Region of Kentucky. It will regulate runoff from a 208 square mile watershed. The project involves 20,813 acres and the flood pool will be maintained at 645 feet above mean sea level with a 630 foot normal pool. The area is largely forest and woodland with some agriculture. Environmental impacts include: regulation of downstream flow, conversion of a stream and upland to a lake, loss of 2,500 acres of wildlife habitat, increased lake fisheries, changes in land management practices, and increased development of adjacent land. Adverse environmental impacts include: loss of cropland and wildlife habitat, loss of a natural stream environment, temporary erosion and sedimentation during construction, water quality impairment, and alteration of the living arrangements of long time area residents. Alternatives which were evaluated include: alternative sites, non-structural flood damage controls, recreational development of the stream, recreational development elsewhere, and imposition of more stringent waste discharge requirements. (Grant-Florida)
W72-14561

EDEN WATERSHED, MISSISSIPPI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Jackson, Miss.
For primary bibliographic entry see Field 04D.
W72-14562

TRAINING DIKE AND BREAKWATER, EVERETT HARBOR, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-200 374F. $3.00 in paper copy, $0.95 in microfiche. August 27, 1971. 32 p, 1 plate, 5 tab.

Descriptors: *Washington, *Dikes, *Wave action, *Coastal structures, *Environmental effects, Turbidity, Safety factors, Engineering structures, Aquatic environment, Estuarine environment, Aquatic habitats, Pollution sources, Fish conservation, Wildlife conservation, Harbors, Fisheries, Wildlife habitats, Water quality control.
Identifiers: *Environmental impact statements, *Everett Harbor (Wash).

Everett Harbor, within the corporate limits of the city of Everett, is in western Washington about 30 miles north of Seattle. The proposed project involves raising the southerly 4,100 feet of the training dike along the Snohomish River to an elevation of 18 feet above mean low water. Additionally the dike will be extended 1,500 feet southwesterly at the same elevation. The project would provide protection from waves for various industries and the boat basin. The project would permanently cover about 13 acres of estuary bottom, thereby affecting fish and wildlife. Turbidity may temporarily affect fishery resources during construction. Adverse impacts include the permanent conversion of 13 acres of estuarine bottom to jetty, aesthetic loss in the dike area, loss of fishery resources in the area of the extension, and impairment of water quality due to debris. Detailed alternative studies were limited to investigating 'no further development' and the use of a composite rubble mound and a planked steel pile dike. No drastic changes in the long-term productivity of the area are anticipated. (Waldron-Florida)
W72-14566

ALTERNATE DISPOSAL METHOD FOR DETROIT AND ROUGE RIVERS, WAYNE COUNTY, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 05G.
W72-14568

LINCOLN LAKE, EMBARRAS RIVER, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.

Available from the National Technical Information Service as PB-198 998D. $3.00 in paper copy, $0.95 in microfiche. April 28, 1971. 16 p.

Descriptors: *Illinois, *Environmental effects, *Dam construction, *Multiple-purpose projects, Damsites, Flood control, Flood protection, Dams, Water management (Applied), Decision making, Alternate planning, Adoption of practices, Balance of nature, Lakes, Project planning, Recreation, Water quality control, Lake fisheries, Stream fisheries, Fish conservation, Wildlife habitats, Waterfowl, Water supply.
Identifiers: *Environmental Impact Statements, *Lincoln Lake, Embarras River (Ill).

The Lincoln Dam site is on the Embarras River near the Coles-Cumberland County, Illinois line. The project will convert 29,600 acres from private to public use and will inundate approximately 6,600 acres. Authorized purposes include flood control, general recreation, fish and wildlife recreation, water supply, and water quality control. Adverse environmental effects include the

following: loss of agricultural land, forests, and wildlife habitat; decrease in wildlife population; conversion of approximately 34 miles of free-flowing stream to a slack-water lake with a concurrent modification of the ecosystem; increased development in the area; possible extinction of the Harlequin Darter; and deterioration from the standpoint of wildlife, forests, natural aesthetics, noise, and air pollution. Non-structural measures and alternate structural measures such as levees and channel improvements were considered but rejected. The alternative of no action would mean the loss of tangible benefits for flood control, water supply, water quality, general recreation and fishery enhancement. The present dam site was found to be the most economical, as well as the most suitable from an environmental viewpoint. (Widman-Florida)
W72-14569

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-200 941D. $3.00 in paper copy, $0.95 in microfiche. March 31, 1971. 13 p, 1 tab.

Descriptors: *Kentucky, *Environmental effects, *Dam construction, *Flood control, Water quality control, Multiple-purpose projects, Alternate planning, Sedimentation, Adoption of practices, Water management (Applied), Recreation facilities, Reservoirs, Watershed management, Flooding, Wildlife habitats, Fisheries, Aquatic habitats, Tributaries, Recreation, Aesthetics, Turbidity.
Identifiers: *Environmental Impact Statements, *Yatesville Lake, Ky.

The project involves construction and operation of a dam and other facilities for flood control, water quality control, recreation, and fish and wildlife enhancement in Lawrence County, Kentucky. The project will regulate runoff from a 208 square mile watershed. Environmental impacts include regulation of downstream flow, conversion of stream and upland to a lake, entrapment of sediment, change in forest management practices on acquired lands, and change in land use in the lake area. Adverse environmental effects include loss of cropland and forest land and some types of biotic habitat, increased fire hazards, reduced aerobic biodegradation, increased sewage production, and a general disruption of the environment of persons and groups now occupying the lands to be acquired. Alternatives include restraint of development downstream, construction of a reservoir elsewhere, imposition of more stringent requirements for discharge of wastes from existing and prospective developments, local flood protection works, non-structural flood damage controls, recreational development of the stream, fish and wildlife management in the area, increase in recreational and development elsewhere, and no action. (Widman-Florida)
W72-14571

ANACOSTIA RIVER AND TRIBUTARIES, PRINCE GEORGES COUNTY, MARYLAND, LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-14574

DUCK RIVER PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Science.

Available from the National Technical Information Service as PB-208 869F. $6.00 in paper copy, $0.95 in microfiche. Tennessee Valley Authority Report TVA-OHES-EIS-72-5, April 28, 1972. 338 p, 10 fig, 14 map, 20 tab, 6 chart, 27 ref.

Descriptors: *Damsites, *Tennessee Valley Authority, *Environmental effects, *Multiple-purpose projects, Flood control, Water quality control, Water supply development, Water resources development, Rivers, Reservoirs, Water utilization, Recreation, Land use, Ecology, Floodplain zoning, Project benefits, Costs, Feasibility, Water control, Water policy, Tennessee, Dam construction, Reservoir construction, Project purposes, Wildlife habitats, Fisheries, Social Aspects, Alternative planning.
Identifiers: *Environmental Impact Statements, *Duck River (Tenn).

The proposed multipurpose water resource development project on the upper Duck River in Middle Tennessee will consist of two dams, which will convert presently uncontrolled sections of the river into two reservoirs. The dams will be operated as a unit and as part of the Tennessee Valley Authority water control system. The principal environmental impacts would be on land and water use; stream flow control for flood, drought relief, and water quality; and the ecosystem of the project area. The project will have adverse effects on certain fish and wildlife values, existing stream-oriented ecosystems and recreation opportunities, certain archaelogical values, present land uses, certain water quality parameters, and will require relocation of 396 families. Foregoing action would neither cure present problems nor expand the range of beneficial uses of the environment, as would the project. Alternative sources of water supply such as impounding tributaries, piping water, or use of groundwater would prove insufficient. Alternative measures which would provide control of water quality equivalent to that of the project also are unfeasible. Alternative dam sites and pool levels, levees, stream enlargement, and the use of flood plain zoning would be found unfeasible as alternative measures for purposes of flood control. (Ellis-Florida)
W72-14575

DESIGN ASPECTS AND PERFORMANCE CHARACTERISTICS OF RADIAL FLOW ENERGY DISSIPATORS,
Texas Univ., Austin. Center for Highway Research.
For primary bibliographic entry see Field 08B.
W72-14730

CONNECTICUT RIVER BASIN PLAN FOR COMPREHENSIVE DEVELOPMENT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
New England River Basins Commission, Boston, Mass.

Available from the National Technical Information Service as PB-206 621-D, $9.00 in paper copy. August 20, 1971. 825 p, 10 fig, 7 map, 12 tab, 3 append.

Descriptors: *Environmental effects, *Connecticut River, *River basin development, *Flood control, Flood plain zoning, Flood proofing, Warning systems, Ice jams, Dams, Dikes, Reservoirs, Low-flow augmentation, Waste treatment, Thermal pollution, Powerplants, Hydroelectric power, Nuclear powerplants, Water quality control, New England, Anadromous fish, Wildlife, Navigation, River basin commission.
Identifiers: *Environmental Impact Statements.

The project consists of a series of proposals for improving the Connecticut River Basin through Connecticut, Massachusetts, New Hampshire and Vermont. Among the project's ten recommended elements are water quality, power, outdoor recreation, anadromous fisheries restoration, water supply, navigation and flood control. An early action plan for the next ten years and extension and expansion plans to the year 2020 are provided. The plan involves construction of new facilities and structures in the areas of water quality, navigation, and flood control. Environmental impacts of implementing the plan include the following: improved long-term water quality goals, management of upstream water related lands, preservation of historic sites, stream bank acquisition for recreation, added public land for recreation, and increased flood protection. Adverse environmental effects include the cost and inconvenience of implementation, loss of extensive areas of wildlife habitat, spoil disposal, inundation of lands, loss of free-flowing sections of streams, possible water temperature changes, loss of fishery values, and possible water quality impairment. The alternatives to the plan involve no action, partial implementation or replanning with different criteria. Each alternative is analyzed. (Nielsen-Florida)
W72-14751

PUEBLO DAM AND RESERVOIR, FRYINGPAN-ARKANSAS PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo. Region 7.

Available from the National Technical Information Service as PB-206 272-D, $3.00 in paper copy, $0.95 in microfiche. December 1971. 107 p, 10 fig, 8 chart, 4 append.

Descriptors: *Environmental effects, *Colorado, *Dam construction, *Reservoirs, Flood control, Project planning, Multiple-purpose projects, Water resource development, Reservoir operation, Federal government, Sediment control, Irrigation, Water storage, Flood protection, Water supply, Flooding, Water utilization, Water pollution, Water quality control.
Identifiers: *Environmental Impact Statements, *Pueblo (Colo), Arkansas River.

This project consists of the construction of Pueblo Dam and Reservoir six miles west of Pueblo, Colorado, as a major feature of the Fryingpan-Arkansas Project. Its principal functions are to provide storage and regulation of water supplies for irrigation, municipal and industrial use; flood control; recreation and fish and wildlife enhancement; sediment reduction; and regulation and storage of Project water and the native flows of the Arkansas River. The dam and reservoir will inundate eight small farms; augment water supply for municipal, industrial and agricultural uses; provide flood control for the Arkansas Valley; make it possible for Colorado Springs to divert water from the Arkansas River above the reservoir for municipal and industrial purposes; and provide a new reservoir type aquatic ecosystem. Adverse effects include occasional water surface fluctuation which would hinder fishery reproduction and recreational activities; temporary destruction of existing landscape; short term air, water and sound pollution problems; and inundation of 4,646 acres of land and 9 miles of natural river. Alternatives considered were no dam and reservoir, enlarge Twin Lakes, and dam and reservoir construction at an alternative site. (Widman-Florida)
W72-14753

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-200 795-D, $3.00 in paper copy, $0.95 in microfiche. June 16, 1971. 10 p, 1 map.

Descriptors: *Missouri, *Dam construction, *Environmental effects, *Flood protection, Water quality control, Water resources development, Project planning, Dams, Flood control, Floods,

Flooding, Multiple-purpose projects, Recreation, Artificial lakes, River regulation, Flow control, Wildlife habitats, Flood damage.
Identifiers: *Environmental Impact Statements, *Little Blue River (Mo).

The project provides for construction of a dam and lake on Little Blue River in the Kansas City metropolitan area. This will provide downstream flood protection, provide major open space and a lake of 930 acres for recreation, and encourage development in the vicinity of the lake and in the lower basin. Adverse environmental effects will include possible water quality problems, inundation of 930 acres of land, loss of six miles of natural free flowing stream, loss of additional wildlife habitats due to increased development, and the development of mud flats in the upper reaches of the lake. Alternatives include eleven alternative lake sites, no action, and non-structural regulatory measures. Irreversible and irretrievable commitments of resources include destruction of six miles of stream and associated wildlife, inundation of 930 acres of agricultural bottomlands and habitat, and inundation of an additional 1,030 acres at varying intervals. (Brackins-Florida)
W72-14757

BLUE SPRINGS LAKE, LITTLE BLUE RIVER LAKES, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-202 652-F, $3.00 in paper copy, $0.95 in microfiche. December 1971. 35 p, 1 map.

Descriptors: *Missouri, *Multiple-purpose projects, *Flood protection, *Environmental effects, Dam construction, Levees, River basin development, Streamflow, Wildlife habitats, Recreation, Soil erosion, Flood plain zoning, Watershed management, Runoff, Fisheries, Natural streams, Flood protection.
Identifiers: *Environmental Impact Statements, *Little Blue River Lakes (Mo), Jackson County (Mo).

The Blue Springs Lake Project is part of a plan to develop two lakes, channel works, and levee protection in the Little Blue River Basin, Missouri. The project involves acquisition of 2,730 acres of land and construction of a dam and a lake in the Kansas City metropolitan area. The project would control runoff for a 32.8 square mile area, provide for flood control, recreation, and fish and wildlife enhancement. Environmental impacts include provision for downstream flood protection, provision for open space and a 560-acre lake, inundation of 5 miles of stream and habitat, possible lake water quality impairment from nutrient concentration, and increased area development. Unavoidable adverse impacts include inundation of 560 acres of land; loss of 5 miles of unobstructed stream; displacement of some animal species; reduction of wildlife and wildlife habitat; and temporary noise, erosion, and equipment exhaust during construction. Alternatives considered include eleven alternate lake sites, flood plain zoning, and no action. (Grant-Florida)
W72-14759

PANAMA CITY HARBOR, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Office of the Chief of Engineers (Army), Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-14769

KINGSTREE BRANCH FLOOD CONTROL PROJECT, BLACK RIVER BASIN, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-14770

WALLISVILLE LAKE, TRINITY RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.

Available from the National Technical Information Service as PB-206 058-F, $3.00 in paper copy. December 18, 1971. 389 p, 22 fig, 6 plate, 33 tab, 2 append.

Descriptors: *Texas, *Multiple-purpose projects, *Dam construction, *Environment effects, Navigation, Flood control, Water supply, Saline water-freshwater interfaces, Saline water intrusion, Estuaries, Tidal marshes, Aquatic habitats, Fisheries, Estuarine fisheries, Fish reproduction, Fish conservation, Lakes.
Identifiers: *Environmental Impact Statements, *Wallisville Lake (Tex).

The project involves construction of a low earth dam in the delta of the Trinity River near its entrance into Trinity Bay. The bay is part of the Galveston, Texas Bay estuarine system. The dam will form a multiple purpose reservoir with a 45,000 acre-feet storage capacity. The project is designed to provide salinity control, navigation, water supply, recreation, and fish and wildlife enhancement. Environmental impacts of the project include prevention of salt water intrusion which now exists, provision for navigation passage upstream, augmentation of the water supply, and creation of a shallow freshwater lake which can be used for water supply. Adverse impacts of the project include loss of 7,200 acres of estuarine nursery area in upper Trinity Bay, which will reduce salt water habitat and fishery resources in the bay. Alternatives include cessation of construction; completion of the navigation channel, lock and floodgates, and construction of a salt water barrier upstream; and other variations in scope and location of project features. (Grant-Florida)
W72-14929

DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.

Available from the National Technical Information Service as PB-206 460-F, $3.00 in paper copy. March 19, 1971. 28 p, 3 tab.

Descriptors: *Texas, *Channel improvement, *Environmental effects, *Flood protection, Flood control, Dredging, Channel flow, Canal design, Hydraulics, Surface drainage, Water conveyance, Storm runoff, Settling basins, River basins, Watersheds (Basins), Aesthetics, Flood damage, Flood forecasting, Vectors (Biological).
Identifiers: *Environmental Impact Statements, *Munday (Tex).

The project involves construction of flood control structures to provide flood protection to Munday, Texas. Project features include channel enlargement and improvement of existing channels for a distance of 4.02 miles. The system is designed to intercept, control and divert the runoff from a 19.6 square mile area in the Lake Creek-Brazos River area. The environmental impact of the proposed project includes reduced frequency of damage-producing floods from approximately two years to those less frequent than 100 years and corresponding development within the city of Munday. No vegetation or habitats exist on channel rights-of-way so no such destruction will result, and vector control measures will be necessary due to water entrapped in the stilling basin. Adverse impacts are minor and involve some slight aesthetic impairment and a loss of 60 acres of agricultural land. Alternative measures which were considered include flood plain zoning as an exclusive measure, construction of a levee system, and no action. (Grant-Florida)
W72-14930

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.

Available from the National Technical Information Service as PB-202 292-D, $3.00 in paper copy. July 1971. 12 p, 1 plate.

Descriptors: *Nebraska, *Environmental effects, *Flood control, *Watershed management, *Water resources development, Multiple-purpose projects, Project planning, Flood protection, Flood plain zoning, Channel improvement, Levees, Impoundments, Artificial lakes, Land use, Non-structural alternatives, Watersheds (Basins), Water management (Applied).
Identifiers: *Environmental Impact Statements, *Papillion Creek (Neb), Omaha (Neb).

The project consists of the construction of 21 lakes and the implementation of a flood plain management program on the tributaries of the Papillion Creek basin in Nebraska. The structures would control drainage from 47% of the 42 square mile basin. The proposed plan would provide flood protection and create 4250 acres of lake surface. 4700 acres of land would be managed exclusively for wildlife benefits while the remaining 7680 acres of land would maintain open space around project sites for public use. Adverse environmental effects include eliminating approximately 44 miles of riparian wildlife habitat, losing 16,630 acres of agricultural land in the basin, and degradation of the impounded waters due to increased development around the lakes. Alternatives include flood plain zoning, channel improvements and levees, and flood proofing and diversions. The commitment of labor and material resources associated with construction of the project would be irretrievable. Attached is a map illustrating the flood control plan for the Papillion Creek watershed. (Widman-Florida)
W72-14931

LOCAL PROTECTION PROJECT, WATERLOO, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 08D.
W72-14933

8B. Hydraulics

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
S. A. Schumm, and H. R. Khan.
Geological Society of America Bulletin, Vol 83, No 6, p 1755-1770, June 1972. 22 fig, 5 tab, 24 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Meanders, *Hydraulic models, Model studies, Sediment transport, Sedimentation, Regime, Regimen, Stream erosion, Scour, Suspended load, Bed load, Braiding.

A series of experiments was performed in a large flume to determine the effect of slope and sediment load on channel patterns. Sediment loads and slopes were closely related, and as slope and sediment loads increased, threshold values of these variables were encountered, at which channel patterns altered significantly. At a very low slope and sediment load, the channels remained straight, but at a discharge of 0.15 cfs, a meandering-thalweg channel formed at slopes greater than 0.002. With increased slope and sediment loads, thalweg

sinuosity increased to a maximum of 1.25. At slopes greater than 0.016, a braided channel formed. The model channels responded to increased sediment loads by maintaining steeper gradients and by major channel pattern changes, but at very gentle slopes and at steep slopes, the channel could not be forced to develop a meandering thalweg. Landforms may not always respond progressively to altered conditions. Rather, dramatic morhphologic changes can occur abruptly when critical erosional and (or) depositional threshold values are exceeded. The intorduction of clay stabilized the alternate bars of a non-meandering and sour and deepening of the thalweg resulted. A meandering-thalweg channel was thus converted in the model to a meandering channel by the type of sediment load change that has accompanied climatic and hydrologic changes of the recent geologic past. (Knapp-USGS)
W72-14205

RELATIVE SIGNIFICANCE OF HEAD AND BODY SPILL FROM A CHANNELIZED TURBIDITY CURRENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W72-14216

THE EFFECTS OF RAINFALL INTENSITY, PAVEMENT CROSS SLOPE, SURFACE TEXTURE, AND DRAINAGE LENGTH ON PAVEMENT WATER DEPTHS,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 04C.
W72-14360

TRENDS IN BAFFLED, HYDRAULIC JUMP STILLING BASIN DESIGNS OF THE CORPS OF ENGINEERS SINCE 1947,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. R. Basco.
Available from NTIS, Springfield, Va. 22151, as AD-724 536, Price $3.00 paper cover; 95 cents microfiche. Miscellaneous Paper H-69-1, January 1969. 32 p, 13 fig, 2 tab, 11 ref.

Descriptors: *Spillways, *Hydraulic jump, *Hydraulic models, *Design flow, *Engineering structures, Reviews, Flow control, Baffles, Energy dissipation, Dams, Design data.
Identifiers: *Corps of Engineers, *Stilling basin, End sills.

Twenty-one years of hydraulic model tests are summarized on spillways with hydraulic jump type energy dissipators using baffle blocks and end sills. The Coprs of Engineers study was limited to baffled, approximately rectangular, stilling basins that were used below high, concrete and earth dam spillways where the hydraulic jumps formed are either free or only slightly submerged. All primary and computed information is tabulated. The given values of baffle block and end sill geometry were those chosen for the final design, and represnet the ultimate engineering compromise between hydraulic performance and economics. (Woodard-USGS)
W72-14368

RESULTS OF HYDRAULIC AND SHOALING STUDIES IN MARCUS HOOK-SCHUYLKILL REACH OF DELAWARE RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb.
Available from NTIS, Springfield, Va. 22151, as AD-735 777, Price $3.00 paper copy; 95 cents microfiche. Miscellaneous Paper No 2-887, March 1967. 93 p, 31 plate, 12 photo, 27 tab.

Descriptors: *Model studies, *Estuaries, *Delaware River, *Dredging, *Spoil banks, Environmental effects, Tidal effects, Currents (Water), Shoals, Hydrologic data, Dikes, Forecasting, Engineering, Data collections.
Identifiers: *Delaware estuary, Shoaling.

The existing comprehensive fixed-bed model of the Delaware estuary was used to determine the effects of filling several proposed spoil disposal areas and dredging several proposed sediment traps in the Marcus Hood-Schuylkill River reach of the Delaware on tides, currents, and shoaling. Tests were conducted to determine the effects of diking off several areas on hydraulic and shoaling conditions throughout the adjacent reaches of the estuary. The test results consist primarily of measurements of shoaling quantities, tide heights, current velocities, and time-exposure photographs of surface-current patterns. Closing the Tinicum Island and Chester Island back channels would have no adverse effects on the estuary, provided a small-boat channel through Tinicum Island is included. The Mantua Creek anchorage is an effective sediment trap without additional deepening, while additional deepening would increase the ability of the Marcus Hook anchorage to retain sediments. A comprehensive plan for improving the entire reach (Marcus Hook to Schuylkill River), including three silt traps and the Gibbstown spoil disposal area, would materially reduce maintenance dredging in the navigation channel between Marcus Hook and the Philadelphia Navy Yard. (Woodard-USGS)
W72-14370

EFFECTS OF A PROPOSED 35-FOOT CHANNEL TO RICHMOND ON CURRENTS AND SALINITIES OVER THE SEED OYSTER BEDS IN JAMES RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05C.
W72-14376

THERMAL DISCHARGE: A MODEL-PROTOTYPE COMPARISON,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 05B.
W72-14393

PREDICTION OF COLUMBIA RIVER TEMPERATURES DOWNSTREAM FROM GRAND COULEE DAM FOR WIDE EXTREMES OF FLOW AND WEATHER CONDITIONS,
For primary bibliographic entry see Field 04A.
W72-14402

COOLING WATER STRUCTURES FOR FITZPATRICK NUCLEAR PLANT,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-14403

HEATED-EFFLUENT DISPERSION IN LARGE LAKES: STATE-OF-THE-ART OF ANALYTICAL MODELING. PART 1. CRITIQUE OF MODEL FORMULATIONS,
Agronne National Lab., Ill. Center for Environmental Studies.
For primary bibliographic entry see Field 05B.
W72-14409

WIND DRIVEN WATER CURRENTS,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
W. D. Baines, and D. J. Knapp.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol. 91, No. HY2, Proc. Paper 4270, March 1965. p 205-221, 8 fig.

Descriptors: *Dispersion, Hydraulics, *Shear stress, *Winds, *Turbulence, Flumes, Dimensional analysis, Turbulent flow, Currents (Water), Reynolds number, *Open channel flow.
Identifiers: *Air movement, Shear velocity, Vertical contraction, Channel contraction, Lateral contraction, Outer law distribution.

Flow induced in a body of water by wind blowing over the surface is studied in a series of experiments in a laboratory channel. Results are coordinated by dimensional analysis and general principles of turbulent flow. For a large Reynolds number mean and turbulent velocities when related to shear velocity follow an outer law distribution. Effects of vertical and lateral channel contraction are also considered. The distribution of mean velocity was found to be similar for jets at both the surface and the bed, with a relatively static central region. Intensity of turbulence is high and almost uniform across the central region. Dispersion of material in the flow is consequently large although net transport is not. Vertical construction caused an appreciable wind direction change only near the shoreline. Lateral constriction introduced secondary flow. (Oleszkiewicz-Vanderbilt)
W72-14412

THERMAL-HYDRAULIC STUDY: ARKANSAS COOLING RESERVOIR,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 05B.
W72-14414

VELOCITY AND TEMPERATURE IN BUOYANT SURFACE JET,
Tahal Consulting Engineers Ltd., Tel Aviv (Israel).
For primary bibliographic entry see Field 05B.
W72-14416

RIPRAP STABILITY ON EARTH EMBANKMENTS TESTED IN LARGE AND SMALL SCALE WAVE TANKS,
Army Coastal Engineering Research Center, Washington, D.C.
A. L. Thomsen, P. E. Wohlt, and A. S. Harrison.
Technical Memorandum No 37, June 1972, 127 p, 22 ref.

Descriptors: *Shore protection, *Riprap, *Hydraulic models, Embankments, Reservoir design, Seawalls, Earth dams.
Identifiers: *Wave tanks, *Stone levees, *Reservoir protection, *Riprap stability.

Tests of models in wave tanks were made to determine the effectiveness of several riprap designs in protecting embankment slopes from wave action. Models ranging from about 1:20 scale to almost full scale were tested with waves up to about 6 feet high. A range of wave periods were tested; embankment slopes varied from 1 on 2 to 1 on 5; armor layers were composed of quarried stone, glacial boulders and tribars. Relationships that define the effect of wave height, wave periods, embankment slopes and Reynolds number on size of stable armor units were experimentally determined, and are given in graphs and tables. (CERC)
W72-14427

METHOD AND APPARATUS FOR CONTAINING WELL POLLUTANTS,
For primary bibliographic entry see Field 05G.
W72-14451

FIVE FACTORS THAT AFFECT DRILLING RATE,
Oklahoma Univ., Norman.
P. L. Moore.
Oil and Gas Journal, Vol. 56, No. 40, p 141-170, 1968. 32 fig, 27 ref.

Descriptors: *Rotary drilling, Drilling fluids, *Drilling equipment, Hydraulics, Economics, *Hydrostatic pressure.
Identifiers: *Hydraulic horsepower, *Bit horsepower, Mud properties, Drilling-fluid pressure, Annular velocity.

Increases in drilling rate as a result of higher bit weight and rotary speed depend on proper use of hydraulic horsepower. This means there must be enough hydraulic horsepower through the bit to remove formation cuttings as they are generated so that no regrinding occurs. The effect of fluid properties does not tie in directly with hydraulics; however, when it is necessary to increase mud weight, viscosity, or solids content, drilling rate decreases. This decrease may be minimized by using more hydraulic horsepower at the bit. To get highest rates of penetration at lowest cost it will be necessary to use the minimum possible mud weight, viscosity, and solids content, and the maximum filtration. (Campbell-NWWA)
W72-14478

MUD-SCOW DRILLING,
Moss (Roscoe) Co., Phoenix, Ariz.
For primary bibliographic entry see Field 08C.
W72-14495

PROCEDURES USED IN GRAVEL PACKING WELLS.

Johnson Driller's Journal, Vol. 38, No. 2, p 1-4, March-April, 1966. 6 fig.

Descriptors: *Water wells, *Gravels, Well screens, Stratification, Stokes law, Uniformity coefficient.
Identifiers: *Gravel-packing, Tremie pipe, *Size separation, Cross-over method, Well development, Annulus, Under-reaming.

Gravel-packing is defined as a process of placing a selected size grading of gravel (or sand) to fill the annular space between a centrally positioned well screen and the borehole drilled into an aquifer. Conditions are described which must be met if gravel-packing is to be economically practical and successful; e.g., gravel size, size-grading, emplacement, etc. (Campbell-NWWA)
W72-14498

RUBBER FIBER WELL SEAL.

Water Well Journal, Vol. 26, No. 6, p 48, June, 1972.

Descriptors: *Water wells, Well regulations, *Sealants, *Rubber, Well casings, *Grouting.
Identifiers: *Well seals, Tires.

This is a field report on a possible solution to the problem of polluted surface water seepage down the side of the well casing. A rubber fiber, made from ground tires reportedly is, when compressed, waterproof and 'rot'-proof, making a seal between the casing and borehole wall. (Campbell-NWWA)
W72-14499

HORIZONTAL WELLS AND DRAINS,
New Mexico Inst. of Mining and Technology, Socorro.
W. K. Summers.
Water Well Journal, Vol. 26, No. 6, p 36-38, June, 1972. 4 fig, 2 tab, 3 ref.

Descriptors: *Water wells, Drainage systems, *Drainage wells, Drawdown, *Dewatering, Drilling equipment, New Mexico, Arizona.
Identifiers: *Horizontal wells, Slotted pipe, *Seeps, Highway construction.

Brief summaries are presented on the early history of the horizontal well and the basic operation of the equipment presently in use. Selected case histories in Southwestern United States are based on U.S. Bureau of Mines Information Circular 8392: 'Horizontal Boring Technology: A State-of-the-Art Study.' (Campbell-NWWA)
W72-14500

INDUCTION-TUNED METHOD TO DETERMINE CASING LENGTHS IN HYDROGEOLOGIC INVESTIGATIONS,
Pennsylvania State Univ., Middletown, Pa. Capitol Campus.
C. R. Marsh, and R. P. Parizek.
Ground Water, Vol 6, No 6, p 11-17, November-December, 1968. 8 fig, 3 tab.

Descriptors: *Well casings, *Logging (Recording), Conductors.
Identifiers: *Inductance, Magnetic force, Coil (Electrical).

An induction-tuned device was designed and tested under a variety of well casing conditions. It can detect casing lengths to within 0.4 to 2.0 inches for casing ranging from 2 to 14 or more inches in diameter which are made from either magnetic or nonmagnetic materials. The sensing element is a coil whose inductance is changed by varying its proximity to any metallic conductor. Twelve to 14 volts at 4 to 6 milliamperes or less than 0.1 watt is sufficient to power the device. All electrical elements are standard except the probe and all materials can be purchased for about $40.00 exclusive of the reel and cable assembly. (Campbell-NWWA)
W72-14501

HYDRAULIC GRAVEL PACKING FOR DEEP WATER WELLS,
Texas Water Wells, Inc., Houston.
A. E. Fawcett.
Ground Water, Vol 1, No 1, p 16, 24, January, 1963. 6 ref.

Descriptors: *Water wells, *Hydraulic conduits, Well screens.
Identifiers: *Gravel packing, Underreaming, Annular space, Gravel pumps.

The practice of placing gravel by the hydraulic method of pumping gravel into the well bore or underreamed section of the hole and into the annular space around the screen sections and blank liner is discussed. (Campbell-NWWA)
W72-14503

PERCUSSION-REVERSE CIRCULATION WATER-WELL DRILLING SYSTEM DESIGNED AND DEVELOPED IN ITALY,
Massarenti (James) Co., Piacenza (Italy).
I. M. Massarenti.
Ground Water, Vol 2, No 2, p 25-27, April, 1964. 4 fig.

Descriptors: *Drilling, *Water wells, Unconsolidated aquifers, Alluvium, Drilling fluids, *Drilling equipment.
Identifiers: *Percussion drilling, *Reverse circulation, *Italy, Po River.

A new percussion-reverse circulation system, designed and developed in Italy for water-well drilling is described. In a special reverse circulation rig, the percussion bit, consisting of a tube with external welded blades, slides up and down on the outside of the hollow drill pipes, while the hollow drill pipes remain still. The field of application of the reverse circulation method is thus enormously enlarged; either hard, cemented formations or soft, unconsolidated deposits, as well as big boulders of any size are bored much faster and more efficiently than with any other method of drilling, provided that a sufficient source of water is available. (Campbell-NWWA)
W72-14506

MAXIMUM YIELDS FROM MINIMUM AQUIFERS,
Johnson (Edward E.), Inc., St. Paul, Minn.
J. L. Mogg.
Ground Water, Vol 4, No 2, p 11-12, April, 1966.

Descriptors: *Water wells, Drilling, *Logging (Recording), Sampling, Well screens, Turbidity.
Identifiers: *Well design, *Well construction, *Well development, Electric logging, Gravel packing, *Horizontal jetting, Development aid chemicals, Cone of depression.

Maximum yields from minimum aquifers can be accomplished only by strict adherence to best known practice procedures while following the three necessary steps to well completion. These steps are well design, well construction and well development. (Campbell-NWWA)
W72-14509

RECENT DEVELOPMENTS IN THERMOPLASTIC PIPING,
Plastic Pipe Inst., Silver Spring, Md.
For primary bibliographic entry see Field 08G.
W72-14511

BASIC PRINCIPLES OF WATER WELL DESIGN.
Universal Oil Products, St. Paul, Minn. Johnson Div.

Johnson's Driller's Journal, Vol 35, No 4 (Part I) p 1-3, 12-13; No 5 (Part II) p 1-3; No 6 (Part III) p 4-5, 8; 1963; Vol 36, No 1 (Part IV) p 6-7, 10; 1964. 16 fig.

Descriptors: *Water wells, Drilling, Well screens, Aquifer testing, Artesian aquifers, Materials, *Design criteria, *Aquifer characteristics, Permeability.
Identifiers: *Strength requirements, Well diameter, Bacterial slimes, *Construction methods, Gravel packing, Laminated formations, Formation stabilizing.

This series of articles describes the general aspects of water well design for municipal, industrial, and irrigation wells since highest efficiency is required from these well applications, e.g., high yield and high specific capacity, as well as trouble-free operation. Well casing selection, total well depth, and screen length are explored. (Campbell-NWWA)
W72-14512

SAND STUDIES CAN IMPROVE WELL DESIGN.
Universal Oil Products, St. Paul, Minn. Johnson Div.

Johnson Driller's Journal, Vol 34, No 3, p 8-10, May-June, 1962. 5 fig, 1 tab.

Descriptors: Sand aquifers, *Sands, Sandstones, *Particle size, Distribution patterns, *Sieve analysis, Glacial aquifers, Uniformity coefficient.
Identifiers: *Size frequency curve, Percent retained, *Sorting, Cementation (Sedimentary), Outwash.

Water-bearing sand formations provide the largest reservoirs of ground water in the United States.

The grading or size analysis shows the range of particle sizes, the distribution of grain sizes, and the proportion of each size. The features of a sand formation result from the mineral origin of the particles, the way in which they are transported, the conditions under which they are deposited and the in-place physical and chemical changes that occur after deposition. A study of sand and gravel particles is a useful and absorbing undertaking. The water-well contractor's interest is to develop such knowledge which, when combined with his experience, will help him to construct and develop better wells in a given type of sand formation. (Campbell-NWWA)
W72-14513

ROTARY DRILLING - SETTING SCREENS AND DEVELOPING.
Universal Oil Products, St. Paul, Minn. Johnson Div.

Johnson Driller's Journal, Vol 26, No 4, p 1-5, August, 1954. 7 fig, 6 ref.

Descriptors: Water wells, *Rotary drilling, Bentonite, Drilling fluids, *Gels, Viscosity, *Well screens, Sand aquifers.
Identifiers: Invasion diameter, Formation damage, *Well development, Ball clay, Polyphosphates, *Surging, Backwashing, Gravel packing.

Rotary drilling requires special methods of screen emplacement and well development. The effect of mud invasion and removal is explored as well as the 'bail-down' and 'wash-down' methods of screen installation. (Campbell-NWWA)
W72-14517

FIELD AND LABORATORY STUDIES-NAVIGATION CHANNELS OF THE COLUMBIA RIVER ESTUARY,
California Univ., Berkeley. Hydraulic Engineering Lab.
M. P. O'Brien.
Available from NTIS, Springfield, Va 22151, as AD-735 778, Price $3.00 paper copy; $0.95 microfiche. Report HEL-24-4, May 1971. 34 p, 7 fig, 7 tab, 10 ref. DACW72-71-C-005 USACE.

Descriptors: *Model studies, *Navigation, *Estuaries, *Channels, *Columbia River, Hydraulic models, Structure, Prototype tests, Channel morphology, Channel improvement, Tidal effects, Sediment transport, Bed load, Currents (Water), Jetties, Engineering.

This model study of navigation channels of the Columbia River estuary was conducted in the years 1932-1936 for the North Pacific Division of the Corps of Engineers. The results of the study are not generally available; consequently, this report is reproduced because of its possible interest. When model scale experiments were proposed, there were two unrelated problems in the area near the mouth of the Columbia; one concerned the channels in the estuary and the other the erosion of the ocean shore just south of the south jetty. The fixed-bed model with a vertical scale of 128 and a horizontal scale of 3600 reproduced with acceptable accuracy the range and lag of tide and the direction and velocity of the currents. The agreement was very good in the channels and deepwater areas near strength of ebb and flood currents. Over shoals and around the time of slack water, the discrepancy between model and prototype was larger. The movement of powdered coal in the model under average and freshet river flows agreed qualitatively with the movement in the estuary. (Woodard-USGS)
W72-14537

GROUNDWATER RECHARGE BY DAMMED UP RIVERS,
For primary bibliographic entry see Field 04B.
W72-14595

EFFECTS OF REMOVAL OF SHOOTERS ISLAND AND SHORE MODIFICATIONS ON TIDES, CURRENTS, AND SHOALING IN THE KILL CHANNELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb.
Available from NTIS, Springfield, Va. 22151 as AD-735 779; Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper No 2-953, December 1967. 68 p, 1 fig, 26 photo, 26 plate, 3 tab.

Descriptors: *Hydraulic structures, *Navigation, *Harbors, *New York, *Channel improvement, Engineering structures, Dredging, Islands, Tidal effects, Currents (Water), Shoals, Data collections, Evaluation.
Identifiers: *New York Harbor.

The existing comprehensive fixed-bed model of New York Harbor was used to determine if construction of a containership terminal on Arthur Kill opposite Elizabethport, New Jersey, would have adverse effects on tides, currents, and shoaling in adjacent Federal navigation channels. Terminal construction plans included the removal of Shooters Island from lower Newark Bay for fill material and widening of Arthur Kill to provide berthing areas adjacent to the terminal. Consideration was given to increasing the depths of the navigation channels in Arthur Kill and Kill Van Kull from the existing 35 ft depth to 42 ft. Tests were made to evaluate the effects of the terminal scheme for both channel conditions. The tests consisted of measurements of tide heights, current velocities, shoaling quantities, and time-exposure photographs of surface-current patterns. From these data it was concluded that construction of the terminal, including the removal of Shooters Island, would have no adverse effects on navigating conditions, maintenance of the Kill Channels, or circulation patterns in the Kills and lower Newark Bay. (Woodard-USGS)
W72-14617

HYDRAULIC GEOMETRY AND LOW STREAMFLOW REGIMEN,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02E.
W72-14680

GRAYS HARBOR ESTUARY, WASHINGTON, REPORT 1, VERIFICATION AND BASE TESTS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. J. Brogdon, Jr.
Available from NTIS, Springfield, Va. 22151, as AD-743 169, Price $3.00 in paper copy; $0.95 in microfiche. Technical Report H-72-2, April 1972. 276 p, 236 fig, 2 tab.

Descriptors: *Model studies, *Hydraulic models, *Harbors, *Tidal effects, *Washington, Engineering structures, Jetties, Navigation, Channel improvement, Dredging, Spoil banks, Coastal structures, Pacific Ocean, Currents (Water), Analytical techniques, Data collections, Hydrologic data.

Grays Harbor model, a fixed-bed model with provisions for future conversion to a movable-bed model, was constructed to scales of 1:500 horizontally and 1:100 vertically and reproduced all of Grays Harbor, Washington, the Chehalis River to the head of tidal influence (South Montesano), and a portion of the Pacific Ocean adjacent to the harbor entrance. The primary purposes of the model study are to determine the effects of rehabilitation of both the north and south jetties, investigate the stability of Point Chehalis, determine the effects of enlarging and realigning the navigation channel, and locate suitable dredge spoil disposal areas. The flushing rate and dispersion characteristics of waste materials discharged into the system will be investigated. The model verification tests indicated that the model hydraulic and salinity regimens were in satisfactory agreement with those of the prototype for comparable conditions. It is assumed that the model will provide quantitative answers concerning the effects of the proposed improvement plans on the hydraulic and salinity regimens of the estuary. (Woodard-USGS)
W72-14727

DESIGN ASPECTS AND PERFORMANCE CHARACTERISTICS OF RADIAL FLOW ENERGY DISSIPATORS,
Texas Univ., Austin. Center for Highway Research.
K. Meshgin, and W. L. Moore.
Available from NTIS, Springfield, Va 22151 as PB-208 516; Price $3.00 paper copy; $0.95 microfiche. Research Report 116-2F, 1970. 142 p, 34 fig, 16 ref. 3-5-69-116.

Descriptors: *Energy dissipation, *Flow resistance, *Culverts, *Road construction, *Design criteria, Engineering structures, Testing procedures, Hydraulic jump, Velocity, Analytical techniques, Equations, Model studies, Hydraulic structures.
Identifiers: *Radial flow dissipator.

The feasibility and performance characteristics of a radial flow basin for use as a flow energy dissipator, and design concepts applicable to highway culverts were explored. The radial flow energy dissipator incorporated a vertically curved drop section which induced radial supercritical flow in a rapidly flared basin where an arc of a circular hydraulic jump was formed. High pressures were developed when the flow impinged on the beginning of the basin floor, thus forcing the flow to spread laterally and stay in contact with the flared wingwalls of the stilling structure. The radial flow energy dissipator was effective in stabilizing the jump, reducing the energy of high-velocity flow, and spreading the flow within the basin. The sensitivity of the performance characteristics of the structure to variations in such parameters as the flaring angle of wingwalls, the ratio of the width of downstream channel to the culvert diameters, and the height of the drop from the culvert outlet to the horizontal basin floor were explored. A simplified form of the circular hydraulic jump equation was obtained which was the basis for the design procedure of a radial flow dissipator under a given set of field conditions. (Woodard-USGS)
W72-14730

EFFECTS OF ARTHUR KILL-KILL VAN KULL CHANNEL DEEPENING ON TIDES, CURRENTS AND SHOALING: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb.
Available from NTIS, Springfield, Va 22151 as AD-735 688. Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper No 2-952, December 1967. 7 p, 12 plate, 3 tab.

Descriptors: Channel improvement, *Dredging, *Model studies, *Harbors, *New York, Environmental effects, Forecasting, Shoals, Tidal effects, Currents (Water), Velocity, Navigation, Ships, Engineering.
Identifiers: *Arthur Kill (NY), *Kill Van Kull (NY), *New York Harbor, Channel deepening, Shoaling.

The existing comprehensive fixed-bed model of New York Harbor was used to determine the effects of increasing the depth of the navigation channels in Arthur Kill and Kill Van Kull from the existing -35 ft mlw (below mean low water) depth to -42 ft mlw on tides, currents, and shoaling in the Federal navigation channels. The test results consist of measurements of tide heights, current velocities, and shoaling quantities. The proposed

deepening would have no significant effects on tidal ranges but would cause reductions in tidal current velocities in both Arthur Kill and Kill Van Kull. The overall shoaling rate in the Federal navigation channels in the Kills would be increased about 15%. Shoaling in these channels is now restricted to one reach, adjacent to Shooters Island; however, it appears that new shoals may develop in Elizabethport Range in Arthur Kill and in all three ranges in Kill Van Kull if the channels are deepened to -42 ft mlw. (Woodard-USGS)
W72-14740

A MOMENTUM APPROACH TO OPEN CHANNEL TRANSITIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. W. Patterson.
Available from NTIS, Springfield, Va. 22151, as AD-735-776 - Price $3.00 paper copy; $0.95 cents microfiche. Miscellaneous Paper No 2-848, October 1966. 9 p, 4 fig, 7 ref, 6 append.

Descriptors: *Open channel flow, *Flow characteristics, *Mathematical studies, *Theoretical analysis, *Momentum equation, Analytical techniques, Energy equation, Hydraulics, Velocity, Channel morphology, Hydraulic gradient, Hydraulic structures.
Identifiers: Open channel transitions.

A study of flow conditions upstream and downstream of an open channel transition is summarized. The method of analysis is based on momentum principles, and a theoretical equation is derived to describe the flow. A design procedure is suggested, based on an experimentally determined correction term to be used in the theoretical equation. In considering the energy loss caused by flow through a channel transition, the momentum equation may be written to describe the flow at sections upstream and downstream of the transitions. The inequality in the solution of the momentum equation, given actual upstream and downstream flow conditions, can be attributed to energy loss in and due to the transition. (Woodard-USGS)
W72-14745

MEASUREMENT AND ANALYSIS OF NATURAL-TYPE SURFACE ROUGHNESSES AFFECTING FLUID FLOW,
Connecticut Univ., Storrs. Inst. of Water Resources.
C. J. Posey.
Available from the National Technical Information Service as PB-212 361, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1972. 7 p, 5 fig. OWRR A-020-CONN (1).

Descriptors: *Roughness (Hydraulic), *Flow profile, *Friction, *Statistics, Slopes, Height, Hydraulic structures, Laboratory tests.
Identifiers: *Sand bed roughness, Curvatures.

Investigation of the feasibility of using the statistical distributions of roughness heights, slopes, and curvatures to characterize hydraulically rough surfaces showed first that the direct measurement technique, such as has been employed to find the root-mean-square value of roughness heights, is impractical. When automatically measured and recorded profiles of developing sand bed roughness became available, it was found that each distribution approaches a well defined limit, suggesting that the 95 percentile values may be used to characterize natural-type roughnesses.
W72-14837

SCOUR AND FILL IN THE MISSOURI RIVER AS RELATED TO THE WATER RESOURCES PLANNING,
South Dakota State Univ., Brookings. Water Resources Inst.
For primary bibliographic entry see Field 02J.
W72-14844

DYE DISPERSION PATTERNS FOR THREE OUTFALL LOCATIONS FOR THE WARWICK RIVER SEWAGE TREATMENT PLANT: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14951

FLOOD PEAKS AS MODIFIED BY DAM SIZE AND LOCATION,
State Univ. of New York, Syracuse. Coll. of Forestry.
For primary bibliographic entry see Field 02E.
W72-14954

8C. Hydraulic Machinery

QUANTITATIVE EVALUATION OF POWER SYSTEM RELIABILITY IN PLANNING STUDIES,
Ente Nazionale per l'Energia Elecrtrica, Rome (Italy).
P. L. Noferi, and L. Paris.
Electrical and Electronics Engineers, Transactions, Power Apparatus and Systems, Vol PAS-91, No 2, p 611-618, Mar-Apr 1972. 8 p, 4 fig, 2 tab, 14 ref, disc.

Descriptors: *Reliability, *Evaluation, *Computer programs, Peaking capacity, Simulation, Peak loads (Electric), Monte Carlo Method, Forecasting, Risks, Numerical analysis, Spinning reserve, Overloads, Planning, Network design, Computer applications.
Identifiers: *Power system stability, *Quantitative analysis, Electrical faults, Outrages, Italy, Computer-aided design.

In considering the problem of quantitatively evaluating the reliability of a power system for planning purposes, the use of 2 risk indices in terms of curtailed energy and abruptly disconnected power are discussed. These indices can be evaluated by computer, using the Monte Carlo simulation method. A computer program to numerically calculate and evaluate the indices shows the method's possibilities and practical application. Numerical examples confirm the applicability of the method and show how the results can be used to obtain indications for improvement of system reliability, and suggest methods of determining capability limits of transmission lines during planning studies. (USBR)
W72-14241

BEHAVIOR TO WIND ACTION OF ANGLE AND T BARS ON H.V. LATTICE STRUCTURES,
Societa Anomima Elettrificazione S.p.A, Milan (Italy); and Politecnico di Milano (Italy).
A. Carpena, and G. Diana.
Electrical and Electronics Engineers, Transactions, Power Apparatus and Systems, Vol PAS-91, No 2, p 536-544, Mar-Apr 1972. 9 p, 12 fig, 2 photo, 1 tab, 12 ref, disc.

Descriptors: *Vibrations, *Transmission towers, *Wind pressure, Motion, Structural steel, Laboratory tests, Vortices, Drag, Aerodynamics, Amplitude.
Identifiers: *Vibration tests, Latticework, Lift, Italy, Vibration damping, Vibration tables, Wind tunnels, Slenderness ratio, Bars.

Wind tunnel and vibrating table tests were made on T bars and 90 deg angles to compare aerodynamic stability, and to improve understanding of the behavior of angles with thin walls. Aerodynamic behavior was examined from 2 standpoints: (1) self-excited vibrations caused by lift and drag variations entailed by vibrations themselves; and (2) vibrations excited by periodic vortex shedding. Angle and T sections were tested in a wind tunnel with forces perpendicular to their surfaces. A vibrating table was used to measure damping of bars. In the latter, values of dissipated energy were nearly proportional to the square of vibration amplitudes at the antinode. In lattice systems, damping values 10 times greater than for a single member were measured. Vibrations caused by vortex shedding were determined for Reynolds numbers up to 5 times 10 to the fourth power, and proved dangerous for tension members having slenderness ratios around 300. Self-excited vibrations caused by lift and drag variations are not considered serious. (USBR)
W72-14243

ANALYSIS AND HYBRID COMPUTER SIMULATION OF MULTICONDUCTOR TRANSMISSION SYSTEMS,
Purdue Univ., Lafayette, Ind.
P. C. Krause, and K. Carlsen.
Electrical and Electronics Engineers, Transactions, Power Apparatus and Systems, Vol PAS-91, No 2, p 469-477, Mar-Apr 1972. 9 p, 11 fig, 9 ref, disc.

Descriptors: *Simulation, *Hybrid computers, *Transmission (Electrical), Mathematical models, Electric power industry, Electrical faults, Analog computers, Electric networks, Transmission lines, Electric conductors, Electric potential, Electric current, Analytical techniques.
Identifiers: *Transpositions (Electrical), *Traveling waves, *Transients, Digital to analog converters, Eigenvalues, Switching, Switching surges.

An analytical method uses a hybrid computer to simulate traveling waves on transposed and untransposed transmission systems. Results of studies are given of: (1) a 3-phase, transposed, distortionless, transmission system; (2) a 3-phase, untransposed, lossless, transmission system; and (3) 2 mutually coupled, untransposed, lossless, 3-phase transmission systems. Performances of transposed and untransposed systems during 3-phase and line-to-ground faults are compared. Application of the diagonalization technique yields eigenvalues and eigenvector-matrices, enabling simulation of untransposed transmission systems. The material presented aids the engineer in making comparisons of hybrid computation techniques with other methods of simulation. (USBR)
W72-14244

A COMEBACK FOR REDDY KILOWATT,
G. D. Friedlander.
Institute of Electrical and Electronics Engineers, Spectrum, Vol 9, No 4, p 44-50, Apr 1972. 7 p, 8 fig, 2 tab, 3 ref.

Descriptors: *Electric power production, *Electric power costs, *Electric power, Energy, Fossil fuels, Electric power demand, Peak power, Labor costs, Peak loads, Environmental effects, Nuclear powerplants manufacturing.
Identifiers: Fuel cells, Breeder reactors, Solar power generation, Solar cells, Magneto hydrodynamics, Electric batteries, Public opinion.

The power shortage problem in the U S is heightened by growing public concern for environmental protection, and by stricter Government licensing of nuclear powerplants. The power industry is having difficulty functioning in this restrictive environment. Compounding these difficulties are the problems of: (1) increasing costs of labor, plant construction, fuels and their transportation, and generating equipment; (2) the near-critical shortage of high-grade low-sulfur-content fossil fuels; and (3) the increased lead time required for manufacture and delivery of conventional generating equipment. Alternative methods of electric power generation discussed are: magnetohydrodynamics (MHD), fuel cells, lithium-sulfur batteries, fast-breeder reactors, and solar cells. The primary obstacle to developing new power sources is the lack of adequate funding for

basic research, design and development, and experimentation to reduce the high costs per kilowatt output to the competitive range of conventional fuels. (USBR)
W72-14249

HVDC INTERFERENCE ON MAJOR CANADIAN PIPELINE COUNTERACTED,
Trans Mountain Oil Pipe Line Co., Vancouver (British Columbia).
A. L. Verhiel.
Materials Protection Performance, Vol 11, No 3, p 37-40, Mar 1972. 4 p, 1 fig, 3 tab, 2 ref.

Descriptors: *Direct current, *Corrosion control, Corrosion, Transmission (Electrical), Field tests, Pipelines, Coal tar coatings, Cathodic protection, Submarine cables.
Identifiers: *Pipe-to-soil potential, *High voltage, *Polarization, Canada, Ground return dipoles, Buried cables, Soil resistivity, Induced currents, Induced voltage.

In 1968, the first monopolar HVDC transmission system in North America was put into operation by the British Columbia Hydro and Power Authority. Until 1970, the system operated at 130 kv, with an earth current of 600 amp, or 78 Mw; then uprated to 260 kv, 1200 amp, and 312 Mw. The HVDC dipole supplies power through 3 submarine cables over 30 mi from the mainland to Vancouver Island. Several pipeline systems are in the area; the closest, 16 mi away, carries crude oil. The oil and power companies conducted numerous tests on soil resistivity and pipe-to-soil potential before and after operation of the HVDC system. A 3/32-in. coal-tar enamel coating reinforced with fiberglass and felt was supplemented by rectifier/groundbed cathodic protection. Detailed discussion is included on variations of parameters measured during field tests, for continuous operation of the power system, and for short-time cyclic load changes. Conclusions include: (1) Depolarization can be expected on buried metallic structures subjected to ground current of HVDC systems; (2) polarization can be achieved with cathodic protection; (3) fluctuations of pipe-to-soil potential from -1000 to -2500 mv appear feasible; and (4) loss of cathodic protection causes very rapid depolarization. (USBR)
W72-14250

LIBBY DAM AND LAKE KOOCANUSA, KOOTENAI RIVER, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-14268

POWER PLANT CYCLES FOR DRY COOLING TOWERS,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
For primary bibliographic entry see Field 05D.
W72-14395

EFFECT OF SIZE OF RESERVOIR ON HYDRO PROJECT COST,
National Technical Univ., Athens (Greece); and Public Power Corp., Athens (Greece).
For primary bibliographic entry see Field 06C.
W72-14419

INFLATABLE FLOATING BOOMS,
For primary bibliographic entry see Field 05G.
W72-14457

FLEXIBLE FLOATING BOOMS,
For primary bibliographic entry see Field 05G.
W72-14463

OIL WATER SEPARATION SYSTEM FOR TANKERS,
Esso Research and Engineering Co., Linden, N.J. (assignee).
For primary bibliographic entry see Field 05G.
W72-14465

PROCESS FOR ELECTRICAL POWER GENERATION AND WATER PURIFICATION SYSTEM,
For primary bibliographic entry see Field 03A.
W72-14474

DRILLING OPTIMIZATION,
Pan American Petroleum Corp., Tulsa, Okla.
J. L. Lummis.
Journal of Petroleum Technology, p 1379-1389, November 1970. 12 fig, 9 tab, 7 ref.

Descriptors: *Rotary drilling, *Optimization, Drilling equipment, Hydraulics, *Drilling fluids.
Identifiers: *Drilling variables, Hole problems.

Methods and principles are discussed whereby optimization of a drilling program may be obtained, after looking at the development of rotary drilling to its present, 'automated' stage. Drilling variables, both alterable and unalterable, are discussed, with ways in which they influence both each other and the overall operation. Optimum hydraulics, bit selection, and weight-rpm are other factors cited which are critical in keeping drilling costs down. (Campbell-NWWA)
W72-14475

WHAT WEIGHT AND SPEED PRODUCE THE LOWEST DRILLING COSTS,
E. D. McGhee.
Oil and Gas Journal, p 84-87, March 1960.

Descriptors: *Rotary drilling, *Optimization, Mathematical studies.
Identifiers: *Bit weight, *Rotary speed, Mud systems, Bit-life factors, Drilling-rate factors.

Bit weight and rotary speed, in conjunction with good drilling hydraulics and practices, are two variables which the author believes may soon be calculated automatically for drilling optimization. Used as an example are the practices of one oil company which had been using a form of optimum drilling calculations. Charts made from these calculations had cut drilling time spectacularly. Other oil companies were soon following suit. In addition to factors already noted, rig time, drillability and abrasiveness of formation, and the drilling mud program were also discussed as factors of optimization. (Campbell-NWWA)
W72-14476

FIVE FACTORS THAT AFFECT DRILLING RATE,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 08B.
W72-14478

PROBLEMS ASSOCIATED WITH DESIGN PROGRAMS FOR AIR AND GAS DRILLING,
Oklahoma Univ., Norman.
P. L. Moore.
Drilling Contractor, p 47, 48, 64, May-June 1965. 2 fig, 5 ref.

Descriptors: *Drilling, Drilling equipment, *Fluid mechanics.
Identifiers: *Gas drilling, Design programs, Air drilling.

This discussion of air and gas drilling is directed toward problems associated with program design. Problems of predicting pressure, solids accumulation and critical solids concentration are discussed. To reduce repetition, the terms 'air' and 'gas' have been replaced by the term 'gas'. (Campbell-NWWA)
W72-14479

EFFECT OF BIT WEIGHT ON DRILLING RATE,
Oklahoma Univ., Norman.
P. L. Moore, and C. Gatlin.
Oil and Gas Journal, Vol. 58, No. 21, p 90-93, May, 1960. 8 fig, 8 ref.

Descriptors: *Drilling, Analytical techniques, Rock mechanics.
Identifiers: *Bit weight, Blow energy, Crater volume, Drilling rate, Roller bits.

A review of recent empirical approaches on writing an equation for bit weight on drilling rate is presented. Typical force charts are shown for a weight drop on limestone; these are compared with blow energy and crater volume charts in order to find an optimum weight for the wedge-shaped bit. Some equations for the rate-weight problem are discussed; none is applicable in all cases. (Campbell-NWWA)
W72-14482

EFFECT OF ROTARY SPEED ON DRILLING RATE,
Oklahoma Univ., Norman.
P. L. Moore, and C. Gatlin.
Oil and Gas Journal, Vol. 58, p 170, August, 1960. 2 ref.

Descriptors: *Drilling, Analytical techniques, Rock mechanics.
Identifiers: *Rotary speed, *Drilling rate, Roller-bit drilling.

A review of recent empirical approaches to the effect of rotary speed on drilling rate is presented. Instantaneous drilling rate was found to increase as rotary speed increases. However, at higher rotary speeds, the increase in drilling rate is progressively less than the increase in speed. (Campbell-NWWA)
W72-14483

DESILTING MUDS WITH HYDROCLONES,
Pioneer Centrifuging Co., Houston, Tex.
G. S. Ormsby.

Descriptors: *Drilling fluids, *Desilting, Abrasion, Particle size, Distribution, Mud.
Identifiers: Hydroclones, Mud cyclones, Drilling muds.

Many drilling benefits have been reported from 'desilting' drilling muds. The term and the process are not generally understood. The author explains terminology, lists benefits reported, outlines equipment requirements, and gives general installation and operation pointers. (Campbell-NWWA)
W72-14484

HARD ROCK DRILLING,
Hughes Tool Co., Houston, Tex.
For primary bibliographic entry see Field 08E.
W72-14485

HOW WEIGHT AFFECTS PENETRATION RATE,
Hughes Tool Co., Houston, Tex.
H. B. Woods, and E. M. Galle.
The Oil and Gas Journal, Vol. 55, No. 47, p 88-91, November, 1957. 10 fig, 2 tab.

Descriptors: *Rotary drilling, *Penetration, Drilling equipment, Texas.
Identifiers: *Bit weight, Carbide bits, Toothed bits, *Weight - rate relationships.

An AAODC committee composed of personnel from drilling and equipment companies has made a joint study of the factors that enter into the effect of weight and speed of rotation on penetration. The test site was in Dora Roberts field near Odessa, Texas. An exploration drilling rig was used to drill the well. This is a report of the weight study. (Campbell-NWWA)
W72-14489

MUD-SCOW DRILLING,
Moss (Roscoe) Co., Phoenix, Ariz.
K. G. Brown.
Water Well Journal, Vol. 10, No. 6, June-July, 1956.

Descriptors: *Unconsolidated aquifers, *Southwest U.S., Alluvial aquifers, California, Arizona, Drilling, *Water wells, Gravels.
Identifiers: *Cable-tool drilling, *Mud-scow drilling, Double well casing, Valley fills, Walking beam, *Bailing, Flapper valves.

A special kind of cable-tool drilling, known as mud-scow drilling, is practiced in the alluvial valley fills of the Southwest, primarily California and Arizona. Experience has refined the method and developed a special type of drilling machine, generally known as the California Sky Beam. The problem which led to the development of this method of drilling stems from the fact that most ground water obtained in California and Arizona is found in the alluvial valley fills in the inland areas and in the sand, silt, and delta deposits of the seacoast area. (Campbell-NWWA)
W72-14495

RATING PUMP PERFORMANCE BY CAPACITY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
K. Fowler.
Johnson Driller's Journal, Vol. 42, No. 2, p 4-5, March-April, 1970. 1 fig.

Descriptors: *Pumps, Water wells, Efficiencies, *Pressure head.
Identifiers: Horsepower, Submersible pumps, *Capacity (gpm), Output factor.

Rating water system pumps by pumping capacity or output rather than by motor horsepower has been proposed by the Water Systems Council. This scheme has the advantage of selecting the pump to fit the capability of a given well or the needs of the well owner. The nominal pump rating would be its discharge in gpm when operating at the best efficiency point indicated by the head-capacity-efficiency chart for the pump. (Campbell-NWWA)
W72-14497

AIR PUMP FOR SMALL-DIAMETER PIEZOMETERS,
Nova Scotia Dept. of Mines, Halifax.
P. C. Trescott, and G. F. Pinder.
Ground Water, Vol 8, No 3, p 10-15, May-June, 1970. 8 fig, 5 ref.

Descriptors: *Piezometers, Submergence, *Sampling, *Potentiometric level, Transmissivity, Groundwater.
Identifiers: Pumping lift, *Air pumps, Engines, Check valve, *Hydraulic head.

The engine of a field vehicle can easily be used as an air pump by inserting a commercially manufactured check valve into a spark-plug socket. Small-diameter piezometers can be pumped with compressed air from this source. With sufficient air-line submergence, the air lift method can be used to pump 1-inch diameter piezometers where the pumping lift is less than 70 feet and 1.25-inch diameter, piezometers where the pumping lift is less than 50 feet. In cases where this method will not work, some of the water contained in a piezometer can be pumped out by pressurizing the piezometer if the formation transmissivity is low and the pumping lift is not excessive. The maximum pumping lift is a function of the rate at which pressure in the piezometer is increased and the rate at which water flows into the formation with increasing head in the piezometer. (Campbell-NWWA)
W72-14510

MUD PRESSURE AIDS CABLE-TOOL DRILLING,
Church (M.) Drilling Co., Murray, Utah.
M. Church.
Johnson Driller's Journal, Vol 32, No 3, p 4-5, May-June, 1960.

Descriptors: Drilling, *Drilling fluids, Bentonite, Hydrostatic pressure, Casings, *Artesian aquifers, *Grouting.
Identifiers: *Cable-tool drilling, Backwashing, *Mud sealing, Horizontal jetting, Conductor pipe.

This is a field report on a method which allows easier driving of pipe while cable-tool drilling. Hydraulic pressure is maintained on an envelope of drilling mud surrounding the well casing as it is being driven. The mud lubricates the casing and seals the annular space. (Campbell-NWWA)
W72-14515

RESEARCH TO DEVELOP AND DEMONSTRATE A MOBILE PILOT PLANT FOR REMOVAL OF PHOSPHATE FROM WASTEWATERS BY ADSORPTION ON ALUMINA,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W72-14789

MECHANICS OF DIFFERENTIAL PRESSURE STICKING OF DRILL COLLARS,
Union Oil Co. of California, Brea.
For primary bibliographic entry see Field 08D.
W72-14834

A SEMI-AUTOMATIC GATE TO IMPROVE THE SENSITIVITY OF THE CRUMP WEIR AT LOW FLOWS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
S. C. Knedlhans.
Journal of Hydrology, Vol 16, No 3, p 261-265, July 1972. 3 fig, 1 ref.

Descriptors: *Stream gages, *Weirs, *Instrumentation, *Gaging stations, Water measurement, Automation, Stage-discharge relations, Discharge (Water).

A precalibrated weir can be installed rapidly and gives reliable discharge measurement even when a large downstream head is present (submergence ratio up to 0.96). This is achieved by using simultaneously upstream and downstream head gaging. Insensitivity at low flows can be overcome partly by the installation of a semi-automatic gate which reduces the width of the crest of the weir by one half. (Knapp-USGS)
W72-14947

8D. Soil Mechanics

NEW TRENDS IN IMPROVING PHYSICAL QUALITIES OF ROCKS,
Road and Railway Construction National Co., Prague (Czechoslovakia).
L. Kratochvil.
International Civil Engineering Monthly (Israel), Vol. 2, No. 6, p 241-258, Dec 1971. 18 p, 32 fig, 11 ref.

Descriptors: *Retaining walls, *Embankments, *Soils, Soil properties, Soil mechanics, Construction methods, Plastics, Tensile strength, Analysis, Model tests, Earth pressure, Stress distribution, Bulkheads, Cost comparisons, Construction, Riprap, Earthworks, Costs.
Identifiers: *Reinforced earth, Construction fills, Czechoslovakia, Reinforcing materials, Stability analysis, Field tests.

Reinforced earth involves a relatively new method of constructing retaining walls, embankments, and other earth structures. The method allows earth structures to be constructed with vertical faces. Each layer in a reinforced earth structure is erected in the following sequence: (1) The 10-in.-high skin elements that make up the face of the structure are installed; (2) the 2-3/8-in.-wide reinforcing strips are laid horizontally on the previous reinforced earth layer and attached to the skin elements; and (3) the earth is spread over the reinforcement strips and compacted in 10-in. layers. The material for reinforcement strips should be lightweight, low in cost, resistant to climatic and mechanical damage, and possess great tensile strength. The criteria for selecting earth fill to use with current size skin and reinforcing strips include: (1) Soil should be continuously graded noncohesive or slightly cohesive; (2) too great a percentage of gravel (1-5/8 to 5 in.) should not be used; and (3) stones and boulders larger than 5 in. should be excluded. The theory of reinforced earth, and model and field test results are presented. (USBR)
W72-14239

EFFECT OF FOUNDATION ELASTICITY ON ARCH DAM DEFLECTIONS AND STRESSES,
Uttar Pradesh Irrigation Research Inst., Roorke (India).
For primary bibliographic entry see Field 08A.
W72-14240

TESTING TRANSMISSION LINE BELLED AUGER FOOTINGS,
Bureau of Reclamation, Denver, Colo.
R. S. Saliman.
Paper, American Special Conference on Performance of Earth-Supported Structures, Purdue Univ., Lafayette, Ind, June 1972. 16 p, 8 fig.

Descriptors: *Transmission towers, Foundations, Field tests, Field data, Construction practices, Movement, Foundation failure, Tornadoes, Model tests, Footings, Field investigations, Foundation investigations.
Identifiers: *Uplift footings, *Belled fottings, *Pull-out tests, *Uplift resistance, *Auger-type footings, Belled anchors, Test results, Ponding tests.

With the advent of self-supporting steel tower construction for high-voltage transmission lines, footing design became an important factor in transmission line economics. Because of the variety of soil conditions found along a transmission line and the number of footings involved, economical but adequate footing designs are important. Concrete belled auger footings best satisfied design requirements. These footings are constructed by augering a hole of a certain depth into the foundation material, enlarging the bottom of the hole to form a bell, and filling the hole with concrete. During 1947, full-scale tests of belled auger tower footings were performed by the Bureau of Reclamation at several locations in California. No additional tests were made until 1960, when the Fort Peck-Dawson County 230-kv Line was built in an area of silty sand foundation material. The last full-scale field tests were made during June 1967, on the Mead-Liberty 345-kv Line. The footing tests, all of

which proved the adequacy of design, are discussed. Tower footing failures during tornadoes in South Dakota and a laboratory method of testing footings at one-seventh scale are reviewed. (USBR)
W72-14246

SAN LEANDRO CREEK SMALL FLOOD CONTROL PROJECT, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, San Francisco, Calif.

Available from the National Technical Information Service as PB-207 056-F. $3.00 in paper copy. November 1971. 88 p, 3 plate, 10 photo, 2 chart, 5 ref, 3 append.

Descriptors: *California, *Flood control, *Environmental effects, *Channel improvement, Flood protection, Benefits, Costs, Dredging, Feasibility, Flood damage, Industries, Water control, Habitats, Ecosystems, Land development, Vegetation, Water management (Applied), Wildlife habitats, Waterfowl, Benthic flora, Benthic fauna, Turbidity, Sedimentation.
Identifiers: *Environmental impact statement, *San Leandro Creek (Calif).

This federal flood control project extends along the lower San Leandro Creek from San Leandro Bay upstream a distance of approximately two miles. The project consists principally of unlined earthen levees with a trapezoidal cross section and rectangular concrete channel. The project will eliminate many existing habitats of both plant and animal life. The recreational use and scenic quality of the area will be enhanced. Better drained land more capable of providing a suitable environment for increased industrial and commercial activity will be provided. Protection against a 100 year flood will be afforded and areas of stagnant water will be eliminated thereby reducing mosquito populations. The project will result in the loss of plants and animals associated with a natural stream and the temporary loss of benthic organisms and pickleweed along the banks within earth channel reach. Nonstructural alternatives were rejected since they would not eliminate floods. Without action flood induced damage to property and structures would continue unabated and the ecosystem could not gain stability. A concrete channel upstream from 98th avenue was selected since it required the aquisition of less right-of-way. Primary benefits to be derived are from the prevention of flood damage. (Ellis-Florida)
W72-14262

CHOWAN RIVER, NORTH CAROLINA, BLACKWATER RIVER, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.

Available from the National Technical Information Service as PB-206 258-F. $3.00 in paper copy. October 1, 1971. 16 p, 1 map, 1 tab.

Descriptors: *North Carolina, *Virginia, *Navigation, *Environmental effects, Channel improvement, Wildlife habitat, Fisheries, Dredging, Turbidity, Fish conservation, Fish establishment, Stream fisheries, Wetlands, Disposal, Landfills, Spoil banks, Project benefits, Alternative planning.
Identifiers: *Environmental impact statement, *Chowan River (N.C.), *Blackwater River (Va).

The proposed project involves construction of three cut-off channels within an eight-mile reach of the Chowan and Blackwater Rivers, which are located in North Carolina and Virginia respectively. The cut-off channels will eliminate three sharp bends in the river channel thereby greatly assisting navigation. The proposed channels will be created by dredging approximately 169,000 cubic yards of material thus converting 28 acres of wooded swamp into navigable waters. Environmental impacts include: reduction in the risk of marine accidents and consequent destruction, loss of 28 acres of swamp woodland, and destruction of three miles of high quality stream fisheries in the bypassed streams. Adverse environmental impacts include the alteration of the wetland habitat and loss of the stream fishery, conversion of tideland into a spoil dumping area, destruction of natural and wildlife resources in the spoil area, and an adverse effect on fish life in the project area due to increased turbidity due to construction. Alternatives which have been considered include land transport, flexibility in selection of disposal sites, flexibility in selection of the time of year in which to work, and no development. (Grant-Florida)
W72-14266

DIKED DISPOSAL AREA PROGRAM, ONTONAGON HARBOR, ONTONAGON, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-14270

DIKED DISPOSAL AREA PROGRAM, ASHLAND HARBOR, ASHLAND, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-14271

ZUMBRO RIVER, MINNESOTA, KELLOGG TO MOUTH, WABASHA COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.

Available from the National Technical Information Service as PB-201 851-F. $3.00 in paper copy. October 6, 1971. 48 p, 4 plate, 7 tab, 1 append, 1 map.

Descriptors: *Minnesota, *Flood control, *Channel improvement, *Environmental effects, Levees, Flood protection, River draining, Flood plain zoning, Flood frequency, Flood flow, Wildlife habitats, Aquatic animals, Aquatic habitats, Stream fisheries, Spoil banks, Vegetation effects, Aesthetics, Sedimentation, Water quality control, Dredging, Spoil banks.
Identifiers: *Environmental impact statement, *Zumbro River (Minn).

The Zumbro River flood control project is located in Wabasha County, Minnesota. The plan calls for 15,900 feet of continuous channel modification and 23,500 feet of improved and realigned levees. The modified channel sill have a 250-foot bottom width. Two curves in the stream will be straightened. Spoil will either be used for levees or placed on spoil banks. The channel will be designed to accommodate a flood flow of 48,000 cubic feet per second. The project will have the following environmental impact: removal of streamside trees and herbaceous cover, alteration of the ecosystem of the surrounding area which has adapted to flooding, alteration of aquatic life, reduced flooding to the extent of only 2% chance of occurrence, and additional flood plain sedimentation. Unavoidable adverse impacts include: loss of natural stream environment and conversion of some stream habitat to a pond, limited fishery development in the channel, temporary loss of 20 acres of wildlife habitat from spoil dumping, and temporary water quality impairment. Alternatives include: an all-channel plan, all-levee plan, upstream reservoir storage, no action, and flood plain evacuation. (Grant-Florida)
W72-14274

HILLSDALE LAKE, BIG BULL CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-202 917-F. $3.00 in paper copy. November 1971. 60 p, 2 map, 4 photo, 4 tab.

Descriptors: *Kansas, *Multiple-purpose projects, *Dam construction, *Environmental effects, Flood control, Water quality control, Recreation, Reservoir construction, Water supply, Missouri River, Turbidity, Silting, Fisheries, Stream fisheries, Wildlife habitats, Aquatic habitats, Streamflow, Alteration of flow, Relocation, Social aspects, Highway relocation, Flood protection, Channel improvement, Flood plain zoning.
Identifiers: *Environmental impact statement, *Hillsdale Lake (Kan), *Big Bull Creek (Kan).

The Hillsdale Lake project is a multiple-purpose project designed to provide flood control, water supply, water quality control, recreation, and fish and wildlife in Miami County, Kansas. The project is part of the Missouri basin plan. A 4,580 acre surface area lake will be created by the rolled earthfill embankment. Recreation sites will be constructed and road and utility relocations will be required. Environmental impacts include: modification of stream flow, temporary adverse effects during construction, flood control downstream, reduced siltation downstream, creation of mudflats within the lake, increased water shortage for downstream marshes, relocation of 92 families, and alteration of the downstream fishery and water quality. Unavoidable adverse effects include: inundation of 4,580 acres of cropland, grassland, and woodland; loss of wildlife habitats and wildlife; elimination of certain water species who live only in flowing water; loss of a stream environment for 12 miles; increased water shortage in downstream marshes; and temporary turbidity, soil erosion, and pollution during construction. Alternatives include: alternate lake sites, no action, single-purpose water supply reservoir, flood plain zoning, and levies and channelization. (Grant-Florida)
W72-14275

NATIONAL ENGINEERING HANDBOOK, SECTION 2-ENGINEERING PRACTICE STANDARDS: PART 1, ENGINEERING CONSERVATION PRACTICES.
Soil Conservation Service, Washington, D.C.

Soil Conservation Service National Engineering Handbook, Section 2, Part 1, April 1971 (revised), various paging.

Descriptors: *Soil conservation, *Engineering structures, *Standards, *Soil mechanics, *Design criteria, Federal Government, Hydraulic structures, Dams, Canals, Floodways, Irrigation systems, Floodgates, Flood protection, Dikes, Drainage systems, Land clearing.
Identifiers: *Soil Conservation Service, *Engineering handbook.

This handbook contains engineering standards for the construction of water retaining structures, drainage systems, irrigation systems, stream channel stabilization works, soil conservation structures and ponds. These standards establish the lowest limit of technical excellence permissible in the planning, design, and construction of these structures. The many variations in climate, soils, topography, or other physical features are factors that influence the adaptation of construction standards in a specific area. Most of these standards have been in use for many years and except for minor changes are as published in the original draft of the SCS National Engineering Handbook. However, the progress made in methods through experience and research, require that standards for conservation practices be reviewed periodically and revised as necessary. (Woodard-USGS)
W72-14364

SAND STUDIES CAN IMPROVE WELL DESIGN.
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W72-14513

WINTERS CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-14559

LEVEE AND DRAINAGE MODIFICATIONS SCAPPOOSE DRAINAGE DISTRICT; COLUMBIA RIVER, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 04D.
W72-14560

DUST ABATEMENT AT CANYON FERRY LAKE, CANYON FERRY UNIT, HELENA--GREAT FALLS DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Billings, Mont. Region 6.
For primary bibliographic entry see Field 04D.
W72-14565

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK AT AND IN THE VICINITY OF BREWSTER, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.

Available from the National Technical Information Service as PB-200 340F. $3.00 in paper copy, $0.95 in microfiche. February 15, 1972. 29 p, 1 map.

Descriptors: *Ohio, *Environmental effects, *Flood control, *Channel improvement, Levees, Pumping plants, Alternate planning, Flood protecton, Multiple-purpose projects, Watermanagement (Applied), Administrative decisions, Comprehensive planning, Adoption of practices, Storm runoff, Flood frequency, Aquatic habitats, Fisheries.
Identifiers: *Environmental Impact Statements, *Brewster (Ohio).

The proposed project consists of two separate actions: modification and construction of levees, and installation of a pumping station at Brewster, Starke County, Ohio; and the modification of Sugar Creek and some tributaries adjacent to Brewster. The primary purpose of the revised levee system is to prevent entrance of floodwaters from Beach City Lake when the project is utilized for impounding runoff from major storms. The other part of the project consists of snagging and clearing Sugar Creek in order to improve the flow characteristics, reduce stages on Sugar Creek, and improve drainage from inside the levee. The project will provide flood protection, improve normal drainage from the protected area, reduce the threat of headwater flooding on Sugar Creek, and decrease the frequency of pumping operations. Adverse environmental effects include changes in land use, decrease in the productivity and desirability of the fishing, loss of some farmland, reduction of fish and wildlife habitat, and temporary increases in erosion and sedimentation. Alternatives considered include floodproofing, evacuation, dam modification, modification of operational procedures, construction of floodway diversions, and no action. Comments are included from various state and local agencies. (Widman-Florida).
W72-14567

MUD MOUNTAIN DAM AND RESERVOIR, WHITE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-200 931D. $3.00 in paper copy, $0.95 in microfiche. July 12, 1971. 14 p.

Descriptors: *Washington, *Environmental effects, *Flood protection, *Dam construction, Channel improvement, Levees, Flood plains, Alternate planning, Tunnel linings, Planning, Water management (Applied), Fish passages, Recreation, Flooding, Earthdams, Reservoir construction, Sediment control.
Identifiers: *Environmental Impact Statements, *Mud Mountain Dam, Wash.

Mud Mountain Dam is a 700 foot long, 425 foot high earth-cave and rockfill structure on the White River near Enumclaw, Washington. The project provides flood control for several towns, farms, and industries in the flood plain along the White River and 106,000 acre-feet of flood storage. Upstream salmon and trout runs are blocked by the dam, but fish passage facilities are provided. Construction of the project and partial removal of vegetation from the reservoir have altered the natural appearances of the area, however, there is some seasonal growth. Adverse environmental effects include: loss of land used for timber and wildlife production; occasional non-adherence to water quality standards affecting stream turbidity with resulting adverse effect on food organisms and eggs in gravel; and injury to juvenile fish using the stream for a nursery area. Because Mud Mountain Dam has been in operation since 1948, the only other possible alternatives concern various schemes for control of the river flow. Considerable study has resulted in a plan to line a test section of the 9-foot tunnel with abrasion-resistant steel in 1971. (Widman-Florida)
W72-14570

SCITUATE HARBOR, SCITUATE, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14572

GENERAL SOIL MAP LOWER PANTANO WASH AREA, PIMA COUNTY, ARIZONA - A SPECIAL REPORT WITH SELECTED ENGINEERING INTERPRETATIONS,
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 07C.
W72-14578

DRAINAGE PIPE STUDY,
Louisiana Dept. of Highways. Research and Development Section.
D. G. Azar.
Available from NTIS, Springfield, Va. 22151 as PB-207-306, Price $3.00 paper copy; $0.95 microfiche. Louisiana Dept. of Highways Research Report No 57, May 1971. 53 p, 16 fig, 1 tab.

Descriptors: *Drains, *Pipes, *Durability, *Soil types, *Louisiana, Testing procedures, Soil tests, Metal pipes, Deterioration, Resistance, Treatment, Coatings, Asphalt.
Identifiers: *Drainage pipes, Life expectancies (Drains).

Estimated life expectancies were determined for several types of drainage pipes submerged in various types of soils in Louisiana. The California method of estimating service life of metal culverts is applicable to conditions found in Louisiana. Thus, by evaluation of soil characteristics in the laboratory, the expected life of metal pipe can be predicted. The life of a metal pipe can be extended by use of a zinc coating and by use of an asphalt coating. The asphalt coating adds an estimated 8 years to the life of the pipe. Tables show the relationship between estimated life and various soil conditions. (Woodard-USGS)
W72-14612

FIELD INVESTIGATION OF SELECTED FOUNDATION PIEZOMETERS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08G.
W72-14738

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04D.
W72-14764

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-200 792-F, $3.00 in paper copy, $0.95 in microfiche. September 28, 1971. 103 p, 3 map, 8 tab.

Descriptors: *Oregon, *Dam construction, *Multiple-purpose projects, *Environmental effects, *Flood control, Irrigation, Water supply, Fish conservation, Wildlife conservation, Recreation, Water quality control, Rock mechanics, Sediment control, California, Land use, Fish migration, Fish reproduction, Wildlife habitats, Non-structural alternatives.
Identifiers: *Environmental Impact Statements, *Applegate Lake (Ore), Rogue River Basin (Ore).

The project calls for the construction and operation of a multiple-purpose dam and reservoir project in Jackson County, Oregon, and Siskiyou County, California. The principal features of the project are: a 2,720,000 cubic yard rockfill embankment dam, a gated spillway, regulating outlet works, fish collection facilities, and a 4.6 mile long reservoir. The project will result in a reduction of downstream floods, debris accumulation and loss of topsoil. There will be increased stream flows during summer and fall low periods. Adverse environmental effects include: blockage of upstream migration of anadromous fish, loss of fish spawning and rearing areas, loss of wildlife habitat and landscape scars. Alternatives to the project are no action, flood plain zoning, levee protection and different types of dams at the same and other locations. There will be an irretrievable commitment of about 988 acres of land which will be converted to reservoir bottom or shoreline. Comment has been solicited and received from appropriate federal, state and private agencies. (Waldron-Florida)
W72-14765

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.

Available from the National Technical Information Service as PB-208 962-D, $3.00 in paper copy, $0.95 in microfiche. November 1971. 38 p, 2 map, 19 tab.

Descriptors: *Pennsylvania, *Environmental effects, *Flood protection, *Multiple-purpose pro-

jects, Earth dams, Dams, Flood control, Water quality control, Streamflow, Stream improvement, Flooding, Reservoirs, Recreation facilities, Wildlife habitats, Habitats, Turbidity, Water control, Water quality, Benefits, Costs, Feasibility, Aesthetics, Project purposes.
Identifiers: *Environmental Impact Statements, *French Creek Basin (Pa), *Woodcock Creek Lake (Pa).

The project, consisting of a rolled earth embankment dam which will control a 46 square mile drainage area, is being constructed as a multi-purpose reservoir for flood control and water quality control for stream flow management. The project will provide a higher degree of flood protection for the French Creek Basin in Pennsylvania, while subjecting about 775 acres of land to inundation and resulting in the loss of approximately two miles of natural stream section. The flood protection and stream flow management will encourage the development of recreation facilities. Adverse effects include the loss of both wildlife habitat and free-flowing stream habitat. During construction, water quality will be affected by a temporary increase in stream turbidity and siltation. A potential for uncontrolled private development will also be created. A large multi-purpose reservoir on French Creek was considered as an alternative to the three-dam system of which this project is a segment and discarded due to local opposition. Other alternatives found impractical included levees, a dam on Woodcock Creek, and flood plain zoning. Foregoing action would not permit realization of optimum system flood control. (Ellis-Florida)
W72-14772

WELL LOG APPLICATIONS IN COAL MINING AND ROCK MECHANICS,
Schlumberger Well Services, Evansville, Ind.
L. O. Bond, R. P. Alger, and A. W. Schmidt.
Society of Mining Engineers of AIME, Preprint No. 69-F-13, 1969. 16 p, 8 fig, 12 ref.

Descriptors: *Rock mechanics, Rock properties, *Coal mines, Sampling, Well data, *Logging (Recording), Lithologic logs, Computer programs.
Identifiers: *Coal seams, Gamma ray logs, Density logs, Sonic logs, Neutron logs, *Thickness determinations, *Strength index.

Initial results of a logging program applied to coal prospects evaluation are presented. Particular applications discussed are: (1) identification of coal seams, (2) measurement of coal seam thickness, (3) evaluation of lithology and moisture index of formations surrounding coal seams, (4) determination of a 'strength index' for formations penetrated by the drill hole, and (5) analysis of coal quality. (Campbell-NWWA)
W72-14831

MECHANICS OF DIFFERENTIAL PRESSURE STICKING OF DRILL COLLARS,
Union Oil Co. of California, Brea.
H. D. Outmans.
Transactions, Society of Petroleum Engineers, AIME, Vol 213, p 263-274, 1958. 12 fig, 2 tab, 11 ref, 7 append.

Descriptors: *Rotary drilling, Drilling equipment, *Hydraulics, Permeability, Drilling fluids.
Identifiers: *Differential pressure sticking, *Drill collars, Radial flow, Mud cake.

Drilling progress is often delayed by sticking of the drill string. The development of preventive and remedial methods has been hampered by incomplete understanding of the sticking mechanism. A recent laboratory investigation has indicated that one type of sticking may be attributed to the difference in pressure between the borehole and formation. The primary cause for differential pressure sticking is cessation of pipe movement, whereas differential pressure and standing time determine the severity of the sticking. (Campbell-NWWA)
W72-14834

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Sacramento, Calif.

Available from the National Technical Information Service as PB-207 435-D, $3.00 in paper copy. March 15, 1972. 120 p, 3 map, 8 photo, 15 tab, 1 chart, 37 ref, append.

Descriptors: *California, *Environmental effects, *Flood protection, *Multiple-purpose projects, Dams, Reservoirs, Flood control, Water management (Applied), Water control, Streamflow, Rivers, Wildlife habitats, Trout, Boating, Recreation, Irrigation water, Hydroelectric power, Water quality control, Fisheries, Water pollution control, Waste water (Pollution), Wild rivers, Rockfill dams.
Identifiers: *Environmental Impact Statements, *Stanislaus River (Calif), *New Melones Lake (Calif).

The New Melones Lake flood control project involves construction of a rockfill dam and reservoir on the Stanislas River, California, about 60 miles upstream from the confluence with the San Joaquin River. The multiple purpose project will provide flood control for agricultural lands and suburban areas, recreation, irrigation water yield, hydroelectric power generation, water quality control flows and fish and wildlife enhancement. The water quality releases will partially contribute to the solution of the pollution problem in the San Joaquin River. Inundation of 10,700 acres of land and sediments and nutrients from upstream will supply a source of water degrading agents. 16 miles of free flowing river supporting a significant trout fishery will be inundated and converted into a lake fishery. The Stanislaus River reach that is presently used by whitewater boating enthusiasts will be inundated. Secondary development both around the reservoir and downstream, stimulated by the project, could increase the residual waste entering the river unless controlled. Wildlife habitat within the reservoir basin will be eliminated. Alternatives considered include no action, a smaller or larger reservoir, channel and levee improvement, or flood plain management. (Ellis-Florida)
W72-14926

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as PB-201 532-D, $3.00 in paper copy. July 1971. 33 p, 5 plate.

Descriptors: *Alaska, *Environmental effects, *Dam construction, *Multiple-purpose projects, Flood protection, Alternate planning, Water resources development, Coordination, Project planning, Stream stabilization, Comprehensive planning, Water management (Applied), Levees, Wildlife habitat, Flooding, Reservoirs, Fisheries, Fish passages.
Identifiers: *Environmental Impact Statements, *Chena River Lakes (Alas).

The project, authorized by the Flood Control Act of 1968, is a multiple-purpose project located in interior Alaska, near the City of Fairbanks. The recommended project is designed to protect the City of Fairbanks and the surrounding community from damaging floods originating on the Tanana and Chena Rivers by a combination of two methods: two earthfill dams to regulate and restrict the Chena and Little Chena Rivers respectively; and a Tanana River levee system. The project will involve relocating 32 families or businesses, inundating a maximum 10,000 acres of marsh and stream habitat during peak flood levels, providing general recreational opportunities, providing habitat for fish and wildlife species, stabilizing flows, and requiring borrow excavation. Construction activities should not have a significant impact on water quality. Adverse environmental effects will include impounding about two miles of free-flowing stream habitat, incurring fishery losses during flood stages, and inundating potential Arctic grayling spawning habitat. Fish passage facilities will be incorporated to facilitate passage of anadromous and resident fish species. Structural and non-structural alternatives were studied and found to be economically unfeasible, environmentally detrimental, or both. (Widman-Florida)
W72-14932

LOCAL PROTECTION PROJECT, WATERLOO, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.

Available from the National Technical Information Service as PB-201 850-D, $3.00 in paper copy. May 19, 1971. 19 p.

Descriptors: *Iowa, *Environmental effects, *Flood protection, *Dam construction, Levees, Reservoirs, Dredging, Channel improvement, Multiple-purpose projects, Project planning, Water resources development, Dams, Flood control, Water management (Applied), Turbidity, Aquatic life, Wildlife habitats.
Identifiers: *Environmental Impact Statements, *Waterloo (Iowa).

The project will provide protection from flooding of Cedar River, Black Hawk Creek, and Virden Creek in Waterloo, Iowa. Protection will consist of earthen levees and concrete floodwalls, a small dam and detention reservoir on Virden Creek, and deepening and widening of the Cedar River channel at specific locations. Adverse environmental effects would include the alteration of the natural shoreline habitat; obstruction of views of natural areas; loss and alteration of aquatic environment in the proposed dredge areas from increased turbidity due to construction and subsequent maintenance operations; loss of bottomland habitat in the borrow areas; and a temporary deterioration of land areas by ponding. Alternatives include no project and five small flood control reservoirs upstream of Waterloo. Included are brief comments from interested agencies. (Widman-Florida)
W72-14933

AN EARTH FILL DAM ON PERMAFROST: HESS CREEK DAM, LIVENGOOD, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
F. F. Kitze, and O. W. Simoni.
Available from NTIS, Springfield, Va 22151 as AD-742 216, Price $3.00 paper copy; 95 cents microfiche. Technical Report 196, March 1972. 50 p, 51 fig, 9 tab, 10 ref.

Descriptors: *Earth dams, *Cold regions, *Alaska, *Cold weather construction, Methodology, Permafrost, Embankment, Engineering structures, Reservoirs, Dams, Flow control, Construction materials, Evaluation.

The Hess Creek in Alaska is a combination hydraulic fill and rolled earth fill structure containing about 479,000 cu yd of earth fill. A steel sheet pile cutoff wall runs along the base centerline. A 48-in.-diameter metal pipe outlet with control gate was installed through the embankment at one end and a spillway 1300 ft long and 100 ft wide to accommodate flood flow. The performance and present condition of the dam suggest that con-

struction of earth fill embankments on permafrost is feasible and practical. The embankment appears to have had little or no detrimental effect on the underlying permafrost. The refrigeration system installed at the base of the embankment seems to have accomplished its purpose of refreezing foundation soil thawed during the summer construction period. (Woodard-USGS)
W72-14939

8E. Rock Mechanics and Geology

THE ROLE OF ROCK STRENGTH ANISOTROPY IN NATURAL HOLE DEVIATION,
Shell Oil Co., New York.
R. T. McLamore.
Journal of Petroleum Technology, p 1313-1321, November, 1971. 10 fig, 6 ref.

Descriptors: *Rotary drilling, *Rock mechanics, *Anisotropy, Drilling equipment.
Identifiers: Drill bits, Chipping, Hole deviation.

The influence exerted by the interaction of rock and bit is a major factor preventing a comprehensive solution to the problem of natural hole deviation. Described here is an analysis of the bit-tooth chipping mechanism in dipping laminated anisotropic rock. There are encouraging indications that the tendency of the bit to deviate in such rock can be diminished by proper bit-tooth design. (Campbell-NWWA)
W72-14481

EFFECT OF BIT WEIGHT ON DRILLING RATE,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 08C.
W72-14482

EFFECT OF ROTARY SPEED ON DRILLING RATE,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 08C.
W72-14483

HARD ROCK DRILLING,
Hughes Tool Co., Houston, Tex.
L. L. Payne, and W. Chippendale.
Drilling Contractor, p 58-62, June, 1953. 10 fig.

Descriptors: *Rotary drilling, *Drilling equipment, Chert, Abrasion, Rock mechanics.
Identifiers: Tungsten carbide, *Rock bits, *Hard rock drilling.

In drilling hard formations it is necessary to know the characteristics of the formation being drilled which cause it to fall into the category of 'Hard Rock.' Inasmuch as the physical properties of rock examined at the surface may not represent those properties as presented to the rock bit cutters, it is important to study the nature of these changes in properties. An important advancement has been the introduction of a bit employing the use of sintered tungsten carbide inserts as cutting elements. This type of rock bit has shown remarkable results in West Texas, New Mexico, Oklahoma, and the Rocky Mountain areas when used in formations which react to a crushing action. The use of heavy weights and relatively slow rotary speeds is recommended with this type of bit. Some formations, however, which are classified as 'hard' due to their high abrasive properties may have relatively weak binders, and will not respond readily to the crushing action of this type of bit. (Campbell-NWWA)
W72-14485

WELL LOGS PREDICT DRILLABILITY, AID COMPUTERS,
California Univ., Berkeley.
For primary bibliographic entry see Field 08G.
W72-14487

THE ELECTROHYDRAULIC EFFECT: POTENTIAL FOR ROCK DRILLING.

Ground Water Age, Vol 4, No 8, p 34-37, April 1970. 2 fig.

Descriptors: Electrodes, *Drilling, Granites, Tensile stress, Compressive strength, *Tensile strength, Rock properties, *Rock mechanics.
Identifiers: *Electrohydraulic effect, Spark gap, Conductive plasma, *Fracture mechanisms, *Brittle failure, Hoop stresses.

Cavitation was first considered as a possible new energy source for fragmenting rock, but small-scale tests indicated that the pulses from the collapse of tiny vapor bubbles lacked sufficient energy to produce effective fracturing. This fact led to an investigation of the underwater spark discharge, which is a more effective generator of collapsible gas or vapor bubbles. The secondary collapse pulse, however, turned out to be negligible compared with the primary pressure pulse caused by the sudden expansion of the spark channel. The explosive expansion of the spark channel, or the electrohydraulic effect, thus became the prime interest of this study. (Campbell-NWWA)
W72-14830

FURTHER STUDIES OF THE RELATION OF PHYSICAL PROPERTIES OF ROCK TO ROCK DRILLABILITY,
California Univ., Berkeley.
W. H. Somerton, F. Esfandiari, and A. Singhal.
Society of Petroleum Engineers, AIME Paper 2390, 4th Conference on Drilling and Rock Mechanics, Austin, Texas, January 1969. 9 p, 14 fig, 2 tab, 9 ref.

Descriptors: *Drilling, Physical properties, *Rock properties, Rock mechanics.
Identifiers: *Drillability, *Sonic velocity, Triaxial strength, Sonic logs.

The correlation of physical properties of rocks with drilling performance has been extended and some new methods of measuring rock drillability have been proposed. The conclusion that sonic velocity is a good indicator of rock drillability has been substantiated, provided a mineralogical factor is taken into account. Drilling strength, however, shows a linear relation to triaxial strength, which is only slightly dependent on mineralogical character. Triaxial elastic moduli values correlate well with rock drilling parameters. (Campbell-NWWA)
W72-14832

LABORATORY DRILLING PERFORMANCE OF THE FULL-SCALE ROCK BIT,
Jersey Production Research Co., Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W72-14833

TUNNELS--MACHINE EXCAVATION, RATE OF PROGRESS, MACHINE DATA.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

Available from WRSIC, Springfield, Va. 22151 as PB-207 303 - Price $3.00 paper cover; $0.95 cents microfiche. Report REC-ERC-72-9, February 1972. 7 p.

Descriptors: *Tunnel construction, *Water conveyance, *Rock mechanics, *Tunneling machines, Methodology, Engineering structures, Hydraulic structures, Drilling, Reviews, Tunnel design, Colorado, New Mexico, Utah, Nevada.
Identifiers: Tunneling machine data.

Information on 7 machine-bored water tunnels constructed in Colorado, New Mexico, Utah, and Nevada by the Bureau of Reclamation is presented graphically and pictorially. Machine data, rates of progress, tunnel profiles, and rock types and strengths are given for each tunnel. The bored diameters of these tunnels vary from 9 to 20 ft. Rocks encountered in boring were shale, sandstone, siltstone rhyolite, and rhyodacite. The compressive strengths of these rocks were 1,400 to 17,000 psi. The boring rates of the machines used varied from 37 to 107 ft for the average calendar day. The maximum progress was 403 ft in one 3-shift day. This rate was attained in 17.3 hr of machine time while boring an 8 ft, 7 in. finished diameter tunnel through shale having a maximum compressive strength of 6,000 psi. Contract and miscellaneous data also are given for each of the tunnels. (Woodard-USGS)
W72-14960

8F. Concrete

INVESTIGATION OF CONCRETE AGGREGATES AND RIPRAP, KASKASKIA RIVER, ILLINOIS, NAVIGATION IMPROVEMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. J. Houston, and A. D. Buck.
Available from NTIS, Springfield, Va 22151 as AD-740 663, Price $3.00 paper copy; $0.95 microfiche. Army Engineer Waterways Experiment Station Miscellaneous Paper No 6-730, August 1965. 103 p, 2 tab.

Descriptors: *Hydraulic structures, *Navigable rivers, *Materials testing, *Aggregates, *Concrete mixes, *Illinois, *Riprap, Engineering structures, River training, Channel improvement, Analytical techniques, Evaluation.
Identifiers: *Kaskaskia River (Ill), Navigation improvement.

Properties of materials present in locally available sources of concrete aggregate and riprap were investigated for use in the Kaskaskia River, Illinois, Navigation Improvement project in the St. Louis District. The coarse aggregate and riprap materials were crushed limestone, and the fine aggregate was a natural sand which was deficient in the fine fractions. A supply of fine sand was used in making up the size deficiencies. Of the five coarse aggregate sources tested, four were considered as potential suppliers of both riprap stone and coarse aggregate. The other source was considered only as a supplier of riprap. None of the materials contain properties that render them unsuitable for the purposes for which they were tested. (Woodard-USGS)
W72-14616

8G. Materials

FIELD TESTS OF WATER PIPE LININGS: A SUMMARY OF 15TH-YEAR SHASTA AND 10TH-YEAR COLLBRAN PERFORMANCE,
Bureau of Reclamation, Denver, Colo.
J. L. Kiewit.
Bureau of Reclamation Report REC-ERC-72-1, Jan 1972. 72 p, 49 fig, 7 tab, 10 ref, append.

Descriptors: *Protective coatings, *Field tests, *Fresh water, *Test results, Coatings, Linings, Paints, Siphons, Laboratory tests, Performance tests, Screening, Erosion, Penstocks, Epoxy resins, Synthetic rubber, Steel pipes, Water analysis, Asphalts.

Identifiers: *Shasta Dam (Calif), Collbran Project (Colo), Neoprene, Southside Canal (Colo), Phenolic coatings, Immersion, Red lead, Coal-tar coatings, Vinyl-resin coatings, Coal-tar epoxy paints, Metal coatings.

Performance of lining systems for metalwork in continuous fresh water immersion is reported for 2 Reclamation field tests: a penstock at Shasta Dam, Calif (initiated 1949), and a siphon on the Collbran Project, Colo (initiated 1959). Of 26 initial linings, 1 phenolic, 2 red lead phenolic, and 2 vinyl resin linings gave excellent performance for 15 yrs at Shasta. Twenty-five of 36 linings in the Collbran siphon remain defect-free after 10 yrs of immersion. Only a liquid applied neoprene at Collbran was virtually unaffected by moderate sand erosion. Catalyzed phenolic paint, asphalt enamel, coal-tar enamel, and systems containing 13-16 mils of sprayed zinc metal appear suitable for mild erosion exposures. Collbran field lining performance correlated well with laboratory results, indicating the slightly more severe laboratory immersion test probably predicts paint performance accurately for waters naturally occurring at higher elevations. Paints VR-3 and VR-6 vinyl resin, CA-50 coal-tar, and coal-tar epoxy performed about the same in laboratory tests as on Bureau structures. (USBR)
W72-14245

HVDC INTERFERENCE ON MAJOR CANADIAN PIPELINE COUNTERACTED,
Trans Mountain Oil Pipe Line Co., Vancouver (British Columbia).
For primary bibliographic entry see Field 08C.
W72-14250

NEW FAST-DRILLING MUDS ALSO PROVIDE HOLE STABILITY,
National Lead Co., Houston, Tex. Baroid Div.
T. C. Mondshine.
Oil and Gas Journal, Vol. 65, p 84-89, March 1966. 2 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Rheology.
Identifiers: *Hole stability, Rig mechanics.

Industry mud engineers and researchers are developing low-solids drilling muds designed to speed penetration and provide hole stability. Many troublesome shales once thought to require high-solids muds are being drilled faster and at less cost with these water-base, low-solids muds. The following recent developments in mud technology have combined to put such fluid systems within practical reach: (1) Development of agents that control filtrate loss without detrimental increases in viscosity; (2) A better understanding of mud rheology, which, in many cases, permits improvement in cutting-lifting capacity without resorting to large amounts of clay and chemicals; (3) Big strides in solids control, including development of a new double-deck shale shaker; (4) A better understanding of shale chemistry. (Campbell-NWWA)
W72-14477

DRILLSTEM TESTER FREES STUCK PIPE,
Atlantic Refining Co., Casper, Wyo.
B. J. Sartain.
The Petroleum Engineer, p B-87, B-9, October, 1960. 2 fig.

Descriptors: *Rotary drilling, *Fishing, Drilling equipment.
Identifiers: *Differential pressure sticking, Drillstem test tool, Packer.

A pipe stuck by differential hydraulic pressure was released with a drillstem testing tool which might lead to a new hydraulic fishing tool. This tool accomplished in one run what $13,000 worth of conventional fishing equipment did not. Drillstem tester fishing string makes use of a hydraulic tester above the packer. When the packer is seated above the stuck pipe, the tester is opened, creating a pressure drop inside the borehole which releases the stuck pipe. (Campbell-NWWA)
W72-14486

WELL LOGS PREDICT DRILLABILITY, AID COMPUTERS,
California Univ., Berkeley.
W. H. Somerton, and S. El-Hadidi.
The Oil and Gas Journal, p 78-86, November, 1970. 6 fig, 1 tab, 15 ref.

Descriptors: *Drilling, *Optimization, Compressive strength.
Identifiers: *Sonic logs, *Transit time, *Drillability, Well logs, Rock properties.

Optimal scheduling of drilling operations and computerized drilling control require knowledge of the resistance of rock to drilling. The possible use of well-log data for the prediction of drillability can be considered. Sonic-log transit times correlate well with rock drillability, providing a mineralogical factor is taken into account. In optimization of drilling operations, several equations are required. Equations commonly used are: (a) drilling rate, (b) bit tooth wear, (c) bit bearing wear, and (d) the cost analysis of the entire process. (Campbell-NWWA)
W72-14487

WATER-SHUTOFF TECHNIQUES IN AIR OR GAS DRILLING,
Technical Drilling Service, Inc., Midland, Tex.
C. K. Sufall.
A.P.I, Drilling and Production Practice, p 74-77, 1960. 2 fig, 5 ref.

Descriptors: *Drilling, *Grouting, Resins, Gels.
Identifiers: *Air drilling, *Gas drilling, Permeable zones, Shutoff techniques.

Water-shutoff techniques have reached a point where they are generally accepted for field usage if economic gain can be realized. The success, both economical and that of shutting off permeable zones, is a tribute to the planning of a job and the fine work done by the research and service organizations. Several types of shutoff material are now readily available through the service companies as are the tools and techniques needed to complete a water-shutoff job. (Campbell-NWWA)
W72-14488

TESTING AND EVALUATING LOST CIRCULATION MATERIALS,
Oil Well Research, Inc., Los Angeles, Calif.
C. C. Wright.
Drilling Contractor, p 64, 84-97, September-October, 1963. 5 fig, 12 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Fractures (Geologic), Circulation.
Identifiers: *Lost circulation, *Mud losses, Cavernous formations, Vugs.

A lost circulation control program is aimed at drilling the well at minimum cost, both in time and materials. There are two basic approaches to lost circulation control: prevention and cure. Some limiting factors to be considered are bridging agents, cementing agents, gelling agents, oil soluble agents, mud compatibility, and testing gelling agents. (Campbell-NWWA)
W72-14490

ROTARY AIR-DRILLING OF PHOSPHATE DEPOSITS IN SOUTHEASTERN IDAHO,
Harris Drilling Co., Granger, Utah.
H. D. Harris.
In: Anatomy of the Western Phosphate Field, 15th Annual Field Conference, Intermountain Association of Geologists, Salt Lake City, Utah, p 167-171, 1967. 5 fig.

Descriptors: *Rotary drilling, *Phosphates, *Sampling, Drilling equipment, Core drilling, Exploration, Mineral industry, Idaho.
Identifiers: *Gas drilling, Down-hole percussion tool, Compressors, Truck-mounted rigs.

A rapid, low-cost method of obtaining samples for the evaluation of phosphate deposits in southeastern Idaho is provided by the use of a truck-mounted rotary drill rig utilizing compressed air as the circulating medium. The seismograph-type drilling rig commonly equipped for mud or air drilling is compact, fast, portable and is suited for operation in the rugged terrain in which the phosphate beds occur. Air-derived cuttings represent a complete and relatively uncontaminated sample of the drilled interval within certain limitations. (Campbell-NWWA)
W72-14492

A NEW INDEX FOR DETERMINING AMOUNT OF CALCIUM CARBONATE SCALE FORMED BY A WATER,
National Aluminate Corp., Chicago, Ill.
J. W. Ryznar.
Journal of the American Water Works Association, Vol. 36, No. 4, p 473-486, April, 1944. 4 fig, 3 tab, 10 ref.

Descriptors: *Piping systems (Mechanical), Hardness (Water), Corrosion, *Calcium carbonate, *Scaling, Inorganic compounds, Dissolved solids, Water chemistry, Hydrogen ion concentration, *Chemical precipitation.
Identifiers: Langelier Index.

The purpose of this investigation was to obtain a formula that will give a quantitative index of the amount of calcium carbonate scale that would be formed by water at any temperature up to 200 degree F; and to predict, if possible, the corrosiveness of waters that are non-scale forming. The Langelier Index is modified for more quantitative use. (Campbell-NWWA)
W72-14493

DOWN-THE-HOLE TV, THE GREATEST SHOW IN EARTH,
Inspectronic Corp., Long Island, N.Y.
D. P. Lloyd.
Ground Water Age, Vol. 8, No. 6, p 28-35, June, 1970.

Descriptors: *Water wells, Well screens, Well data, *Logging (Recording), Turbidity, *Electronic equipment, Cameras, Flocculation.
Identifiers: *Closed circuit TV, Videotape, Submersible pumps.

For many years, contractors from various industries, particularly the well drilling industry, have questioned the nature and quality of work in areas not accessible to man. Down-the-hole TV gives this opportunity. And it is fast becoming a more useful and important tool -- especially with the technological advancements of the electronics age. Its technical name is CCTV (Closed Circuit Television) but it's more popularly known as Down-the-hole TV. Its basic function is to record, for above-ground observers, the intricacies and problems which go along with bore holes, well screens, pumps, caissons, and sewers. The system is described in some detail. Advantages are emphasized. (Campbell-NWWA)
W72-14496

RATING PUMP PERFORMANCE BY CAPACITY,
Universal Oil Products, St. Paul, Minn. Johnson Div.

For primary bibliographic entry see Field 08C.
W72-14497

INDUCTION-TUNED METHOD TO DETERMINE CASING LENGTHS IN HYDROGEOLOGIC INVESTIGATIONS,
Pennsylvania State Univ., Middletown, Pa. Capitol Campus.
For primary bibliographic entry see Field 08B.
W72-14501

SUPPLEMENTING SAMPLE LOGS,
V. B. Carter.
Ground Water, Vol 4, No 3, p 49-51, July, 1966.

Descriptors: *Logging (Recording), *Water wells, *Drilling, Water quality, Saline water, Aquifer characteristics, *Conductivity.
Identifiers: Temperature survey, *Sample logs, Brown water.

In the past 20 years there has been a substantial increase in the application of electric well logging to water wells. In the early days, there were very few wells being logged, principally city supply wells and other larger commercial wells. Now, it is not uncommon to be called to service water wells of all sizes, even the small back yard well. The well drilling industry is becoming more and more aware of the benefits that can be derived from use of the electric log, and there will almost certainly be an increase along these lines in the years ahead. There are some good reasons for this growth and acceptance of the electric log, and pointing out some of these reasons and applications of the electric logs to water well drilling is the purpose of this paper. (Campbell-NWWA)
W72-14505

RECENT DEVELOPMENTS IN THERMOPLASTIC PIPING,
Plastic Pipe Inst., Silver Spring, Md.
F. W. Reinhart.
Journal of the American Water Works Association, Vol 60, No 12, p 1404-1410, December, 1968.

Descriptors: *Plastic pipes, *Standards, Polymers, *Materials testing, Hydrostatic pressure, Design standards.
Identifiers: *Water piping, *Polyvinyl chloride pipes, *Thermoplastics.

The increase in quality of thermoplastic pipe and fittings has been due to: (1) improved extrusion and molding machinery and techniques used to form plastic pipe and fittings, (2) improvements in thermoplastic piping materials, (3) policies and procedures used to develop recommended hydrostatic design stresses, (4) the National Sanitation Foundation (NSF) inspection and certification programs, and (5) the increase in quality and quantity of the standards for plastic piping. The total effect of these developments has resulted in higher quality pipe and fittings, lower costs, increased confidence on the part of users and engineers and improved performance. (Campbell-NWWA)
W72-14511

WELL PERFORMANCE SHOWN BY SIMPLE TEST,
Johnson (Edward E.) Inc., St. Paul, Minn.
J. L. Mogg.
Johnson Driller's Journal, Vol 34, No 3, p 1-3, May-June, 1962. 2 fig, 1 tab.

Descriptors: *Testing procedures, *Water wells, Transmissivity, Permeability, Specific capacity, Well screens, *Aquifer characteristics.
Identifiers: *Well development, Backwashing, Surging.

A 'water input test' to check development work is described. The test is performed by filling the well casing with water, then noting the rate at which the water level drops. Charts are included for illustration. (Campbell-NWWA)
W72-14514

GRAPHICAL METHOD FOR DETERMINING COEFFICIENT OF TRANSMISSIBILITY,
Illinois State Water Survey, Urbana.
S. C. Csallany.
Journal of the American Water Works Association, Vol 58, No 5, p 628-634, May, 1966. 3 fig, 1 tab, 6 ref.

Descriptors: *Water wells, Hydraulic gradient, *Graphical analysis, Drawdown, *Pumping testing, Aquifer testing, Aquifer characteristics.
Identifiers: *Well yield, *Transmissibility, Numerical solutions, Graphic solutions.

This method attempts to determine accurately the coefficient of transmissibility from specific capacity data. Specific limitations are noted on the use of the graphs. (Campbell-NWWA)
W72-14516

TECHNIQUES OF EVALUATING EFFECTS OF WATER ON DRAINAGE STRUCTURES IN ALABAMA,
Geological Survey of Alabama, Montgomery. Water Resources Div.
J. S. Ellard.
Circular 75, 1971. 14 p, 1 plate, 3 fig, 1 tab, 7 ref.

Descriptors: *Drains, *Steel pipes, *Hydraulic structures, *Durability, *Corrosion, Regression analysis, Least squares method, Water chemistry, Water properties, Water types, Dissolved oxygen, Hydrogen ion concentration, Resistivity, *Alabama, Evaluation, Analytical techniques.

Field inspection and classification of galvanized steel culverts in Alabama was based on an empirical evaluation of existing corrosion and structural conditions. These two conditions were used as the basis of organizing the field data for analysis. Two methods of regressional analysis were used in predicting 'years to perforation' of galvanized steel culverts. One method uses three variables; pH, resistivity, and dissolved oxygen characteristics of the water passing through individual culverts. Resistivity values in excess of 15,000 ohm/cm and dissolved oxygen values less than 4.5 ppm (parts per million) are values synonymous to a passive corrosion condition. Waters with resistivities less than 15,000 ohm/cm and dissolved oxygen values greater than 4.5 ppm appear to be corrosive. A second regressional analysis using the method of least squares involved only pH. 'Years to perforation' predictions from both methods were found to be similar. (Woodard-USGS)
W72-14522

DRAINAGE PIPE STUDY,
Louisiana Dept. of Highways. Research and Development Section.
For primary bibliographic entry see Field 08D.
W72-14612

INVESTIGATION OF CONCRETE AGGREGATES AND RIPRAP, KASKASKIA RIVER, ILLINOIS, NAVIGATION IMPROVEMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08F.
W72-14616

FIELD INVESTIGATION OF SELECTED FOUNDATION PIEZOMETERS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. R. Furlow.
Available from NTIS, Springfield, Va 22151 as AD-735 702. Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper S-69-31, July 1969. 20 p, 23 fig, 4 tab, 2 append.

Descriptors: *Piezometers, *Testing, *Analytical techniques, Instrumentation, On-site tests, Investigations, Mississippi, Correlation analysis, Variability.
Identifiers: *Instrument performance.

The behavior and relative merits of several types of piezometers were studied through field installation procedures and observational data. Selected piezometers were installed at three sites with different piezometric conditions in the vicinity of Vicksburg, Miss. Descriptions of selected piezometers, installation procedures, and observational data for periods ranging from 6 months to 1 year duration after installation are included. The facility of installation and observation was approximately equal for all piezometers tested. The instruments included open standpipe, hydraulic, and diaphragm piezometers. (Woodard-USGS)
W72-14738

WELL LOG APPLICATIONS IN COAL MINING AND ROCK MECHANICS,
Schlumberger Well Services, Evansville, Ind.
For primary bibliographic entry see Field 08D.
W72-14831

LABORATORY DRILLING PERFORMANCE OF THE FULL-SCALE ROCK BIT,
Jersey Production Research Co., Tulsa, Okla.
D. S. Rowley, R. J. Howe, and F. H. Deily.
Transactions, Society of Petroleum Engineers, AIME, p 71-81, 1961. 12 fig, 6 tab, 24 ref.

Descriptors: *Rotary drilling, *Laboratory tests, Permeability, Drilling equipment, Rock mechanics, Drilling fluids.
Identifiers: Formation hardness, *Drilling rate.

Laboratory drilling tests with hard-formation rock bits were made under rock and borehole fluid pressures simulating a 3,000-ft. borehole. The effects of bit weight and rotary speed on drilling rate and bit rotary power were determined in a hard, impermeable dolomite. With added bit weight, the drilling rate and rotary power both increased at an increasing rate; but with added rotary speed, the rate and power both increased at a decreasing rate. The rock volume removed per unit of energy increased as weight was raised or as rotary speed was reduced. Empirical quadratic equations for drilling rate and rotary power were obtained, and bit mechanical efficiency was calculated. (Campbell-NWWA)
W72-14833

CORROSION POTENTIAL OF NTA IN DETERGENT FORMULATIONS.
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05G.
W72-14851

EFFECTIVE USE OF TV SEWER INSPECTION AND SEALING,
Halliburton Co., Duncan, Okla.
T. Lenahan, and J. Herndon.
Public Works, Vol 103, No 7, p 74-76, July 1972. 5 photo, 1 fig, 1 tab, 3 ref.

Descriptors: *Sewers, *Inspection, *Grouting, City planning, Long-term planning, Costs, Management, Maintenance, Leakage.
Identifiers: *Television, *Sealing, Savings.

The use of TV for troubleshooting in sewer lines plagued with complaint calls and line stoppages has become common practice. Problem analysis is keyed by this inspection tool. Users of TV systems

have saved significant amounts of time, labor, and money. In some cases, TV inspection of older lines has resulted in extensive savings on planned rehabilitation programs. The major components of a television inspection system are: camera, mounting skids, light source, cable and reel, measuring device, pulling unit, control unit, and monitor. To operate the system it is necessary to insert a small steel cable through the sewer line between two manholes to pull the camera through the line. The camera, complete with light and mounted on skid runners, is connected to the towing cable, a backup cable, and the TV cable. A grouting system is intended to be used in conjunction with the TV system. It enables the operator to isolate revealed leaks with an air-inflated packer. The leak can be grouted without excavation, with chemical grouting operations performed remotely from the surface. Many municipalities are finding that a real source of savings in the operation of their collection systems is the TV inspection of new lines as they are installed. By using the TV system to inspect an operating line, many problems can immediately be found and a decision for remedial action can then be based on known considerations. The use of television on a regularly scheduled daily basis provides a means for updating or verifying existing sewer maps or plates to show locations of manholes, service connections, or line size variations, as well as locating line sags, infiltration, or broken pipe. (Strachan-Chicago)
W72-14898

8H. Rapid Excavation

THE ELECTROHYDRAULIC EFFECT: POTENTIAL FOR ROCK DRILLING.
For primary bibliographic entry see Field 08E.
W72-14830

8I. Fisheries Engineering

NOTES ON BIOLOGICAL CHARACTERISTICS AND MIGRATION OF THE MASU SALMON, ONCORHYNCHUS MASOU (BREVOOT), IN THE OFFSHORE AREAS OF THE WEST COAST OF KAMCHATKA PENINSULA, (IN JAPANESE),
North Pacific Fisheries Inst., Sapporo (Japan).
K. Shimazaki.
Bull Fac Fish Hokkaido Univ., Vol 22, No 1, p 37-45. 1971. Illus. Maps. English summary.
Identifiers: *Fish physiology, *Fish migration, Oncorhynchus masou, Kamchatka, Peninsula, *Salmon, USSR.

Information obtained from the measurement of the biological characteristics of the samples from 1968 to 1970 and from the migration of the masu salmon is presented. Masu salmon concentrate in the waters south of 53 degree N. The center of distribution was located off the west coast of Kamchatka Peninsula. The average of catch per unit of effort declined rather markedly from the maximum recorded in early June. The average fork length was approximately 45 to 46 cm. No significant difference was found between the fork lengths of males and females. The fork length of the males showed greater variation than those of the females. The proportion of females was 62.4% (58.6-68.3%). The maturity indices (ratio of gonad weight to body weight) were 6 to 7% (90-110 g) for females and about 2% (25-40 g) for males. It may be considered that the natal streams of the masu salmon in this area are located along the west coast of the Kamchatka (from the Bolishaya River to the Icha River). In this area hooks used for the long-line were found in the mouth of some of the masu salmon. These were apparently the same kind of hooks as used only in the Japan Sea south of Hokkaido. These data indicate that the masu salmon in the west coast of the Kamchatka migrate from the Japan Sea.--Copyright 1972, Biological Abstracts, Inc.
W72-14295

SEXUAL MATURATION AND REMATURATION TIMES IN THE SPRING-SPAWNING VOLGA-CASPIAN STURGEON, ACIPENSER GUELDENSTAEDTI BRANDT,
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Saratov (USSR).
V. I. Shilov, Y. K. Khazov, and N. K. Ivoilova.
Identifiers: Acipenser guldenstadti, *Sexual maturation, Spawning, Spring, *Sturgeon, USSR, *Volga-Caspia sturgeon.

Studies on sexual maturation and times of repeated maturation were conducted on A. guldenstadti in the Volgograd Reservoir from 1960-1969. Evaluation of the cross-section of the first ray of the thoracic fin permitted determination of the number of secual maturations in 65% of the spawning sturgeons. Sexual maturation in the males is first achieved when they reach a length of 80-130 cm at the age of 10-31 yr, and in the female when they are 11-35 yr old and 90-125 cm in length. Repeated sexual maturation in the males is observed every 4 to 14 yr, and in the females every 5-14 yr. Such observations agreed well with studies on labeled sturgeons kept in reservoirs after spawning, in which the mean time for repeated maturation of the gonads was 5 yr for the males and 7 yr for the females.--Copyright 1972, Biological Abstracts, Inc.
W72-14530

A FISHERY PROJECT IN LAKE VICTORIA, NYANZA,
Swedish Natural Science Research Council, Stockholm.
E. Bergstrans.
Zool Revy. Vol 33, No 1/2. p 3-16. 1971. Illus. English summary.
Identifiers: Bagrus, Clarias, *Fishery management, Haplochromis, Kenya, *Lake Victoria, Nyanza, Protopterus, *Tilapia.

A short description is given of the lake, the economically most important fishes, Haplochromis, Tilapia, Bagrus, Clarias, Protopterus and the development of the fishing industry from 1900. The FAO-project, Lake Victoria fisheries Research Project, started in 1957. To study the state of the Tilapia-fishery, investigations were made in the fishing camps around Buvuma Island concerning the catch, effort and catch per effort of Tilapia spp. The results showed that catch per net-night decreased from 2 Tilapia in 1957 to 0.1 Tilapia in 1969 while effort had increased from 46,000 netnights/mo. in 1957 to 70,000 in 1969. The situation was similar in Nyanza Gulf, Kenya, while in Tanzania the catches in some places were good. To study the fish stocks in deeper waters a lakewide survey was made, using bottom-trawl. The catches of Haplochromis in the trawl were high enough to justify a future trawl-fishery in Lake Nyanza. The most important problem of the fishermen is the decreasing catch of Tilapia. If the distribution of the fishermen was more even and they also caught other species, the situation could be improved. However, no regulations made by the fishery department will be of any effect if department personnel do not establish close contacts and educate the fishermen.--Copyright 1972, Biological Abstracts, Inc.
W72-14587

SIZE RELATIONSHIP BETWEEN SALMON JUVENILES IN SHORE WATERS AND THEIR PREY ANIMALS,
Hokkaido Univ., Sapporo (Japan). Faculty of Fisheries.
Shun Okada, and Akira Taniguchi.
Bull Fac Fish Hokkaido Univ., Vol 22, No 1, p 30-36. 1971. Illus. Maps.
Identifiers: Copepods, Decapods, Euphausiids, *Juveniles, Oncorhynchus-Gorbuscha, Oncorhynchus-Keta, Parathemisto-Japonica, *Salmon, *Predator-prey relationship.

The stomach contents of 94 chum and 43 pink juvenile salmon, Oncorhynchus keta and O. gorbuscha sampled by the trap set-nets in the shore waters near Mori and Usujiri, southern Hokkaido, during the period from May 28-June 13, 1970 were examined. Small-size prey animals such as microcopepods, young Parathemisto spp., decapods zoea and insects were the food for juveniles smaller than 55 mm in fork length and large-size prey animals such as adults of P. japonica and euphausiids for juveniles larger than 55 mm. The body width of the largest prey animals eaten by various size juveniles (36-104 mm in fork length) ranged from 0.5 mm-3.8 mm. The size of the largest food eaten by juveniles changed rapidly from a small-size group to a large-size group when the predators attained to about 55 mm in fork length. Pre- or post-larvae of 1 sp. of pricklebacks also seemed to be important prey for both small and large juveniles in shore waters.--Copyright 1972, Biological Abstracts, Inc.
W72-14642

NATURAL REPRODUCTIVE CONDITIONS OF THE PIKE-PERCH (LUCIOPERCA LUCIOPERCA) IN THE PSKOV-CHUD WATERS,
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
I. T. Negonovskaya.
Vopr Ikhtiol. Vol 11, No 4, p 740-744. 1971. Illus. Map.
Identifiers: Lucioperca lucioperca, *Perches, *Pike-perch, *Pskov-Chud, Fish reproduction, USSR.

The relatively low population of L. lucioperca in the Pskov-Chud waters has been attributed in the past to inadequate spawning grounds. Studies conducted in 1967 showed that, in fact, the spawning ground was quite adequate and that the low population was due to consumption of pike-perch larva and young by perch and, to a lesser degree, striped perch. Since the pike-perch young left the banks early in their development and moved into the more central portions of the lakes, they became easy prey for the perch and the striped perch.--Copyright 1972, Biological Abstracts, Inc.
W72-14645

EFFECT OF TEMPERATURE ON THE BODY FORM AND MORTALITY IN THE DEVELOPMENTAL AND EARLY LARVAL STAGES OF THE ALASKA POLLACK, THERAGRA CHALCOGRAMMA (PALLAS),
Hokkaido Univ., Sapporo (Japan). Faculty of Fisheries.
Ikuso Hamai, Kenichiro Kyushin, and TetsuichiroKinoshita.
Bull Fac Fish Hokkaido Univ. Vol 22, No 1, p 11-29. 1971. Illus.
Identifiers: *Alaska pollack, Artemia-Salina, *Water temperature, Larvae, *Mortality, Nitzschia-Closterium, Pollack, Theragra-Chalcogramma.

Fertilized eggs were incubated and hatched larvae were reared at 3 constant water temperatures of 10 degree, 6 degree and 2 degree C in circulating or still water conditions. The larvae were fed with Artemia salina nauplii and Nitzschia closterium. The rate of the embroyonic development was higher temperature. Incubation time required from fertilization to 50% hatching ranged from 10 days at 10 degree C to 24.5-27.4 days at 2 degree C. Percentage of hatching was as high as 83-94% at 2 degree C and was lower in the higher temperatures. The average body length of the newly hatched larvae was about 4.60-4.72 mm. Growth was better at a higher temperature. High temperatures operated on the auditory vesicle to make its diameter larger in the larval stage, but no signifi-

cant influence of temperature upon the development of the eye was observed throughout the embryonic and larval stages. Survivals were better at a lower temperature. The survival rate during the yolk absorption period ranged from 20% at 10 degree C to 59% at 2 degree C. No contribution from N. closterium as food for the larval survival was recognized. The effect of chloromycetin on increasing the survival rate in the larval stage was confirmed.--Copyright 1972, Biological Abstracts, Inc.
W72-14685

PERCEPTION OF POLARIZED LIGHT BY YEARLING SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Saint Francis Xavier Univ., Antigonish (Nova Scotia). Dept. of Biology.
P. A. Dill.
J Fish Res Board Can. Vol 28, No 9, p 1319-1322. 1971. Illus.
Identifiers: *Fish physiology, *Fish migration, *Light, Oncorhynchus nerka, Perception, *Salmon.

Food-conditioning experiments conducted in the laboratory demonstrated that groups of yearling O. nerka can discriminate between vertical and horizontal planes of linearly polarized light. Removal of the adipose eyelid, a possible analyser of polarized light, did not abolish the response. The findings support the hypothesis that these fish can use polarization patterns for orientation during their seaward migration.--Copyright 1972, Biological Abstracts, Inc.
W72-14689

[redacted]

[redacted]

THE VOLGA DAM AND THE STURGEON FISHES (IN RUSSIAN),
A. V. Pavlov.
Vopr Ikhtiol. Vol 11, No 4, p 643-649. 1971.
Identifiers: *Fish management, Dams, Fish, *Sturgeon, USSR, *Volga River.

The diversion of water into Astrakhan region by a dam in the upper reaches of the Volga will have an adverse effect on the sturgeon fishes, since a large portion of the spawning fishes shall be retained in the lower waters. Consequently, special locks shall have to be provided to permit the fish to migrate and, to compensate for the loss in fish, 1 or 2 fish breeding stations should be set up in the region of the dam and the young should be released into the eastern part of the Volga delta.--Copyright 1972, Biological Abstracts, Inc.
W72-14739

ECOLOGY, STRUCTURE AND POPULATION MODELS OF THE SOUTH KURILE CHUM SALMON ONCORHYNCHUS KETA (WALB.), (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
V. N. Ivankov, and V. L. Andreev.
Vopr Ikhtiol, Vol 11, No 4, p 615-629, 1971, Illus.
Identifiers: Ecology, South Kurile Islands, Oncorhynchus keta, Fish populations, *Salmon, Spawning, USSR, *Fish reproduction, *Fish migration.

Studies conducted from 1956-1967 on the chum salmon in the South Kurile islands showed that O. keta undergoes spawning migration late in the year (Sept.-Dec.). The high rate of growth of this species resulted in large specimens (72.3 cm long and 4.04 kg in weight). With respect to age, the population of the South Kurile salmon was similar to that found in the Andyr and Yukon rivers; of the total population, 16.7% were 3 yr old, 56.4% were 4 yr old, 26.5% were 5 yr old, and 0.2% were 6 yr old. Despite the large sizes and the rapid growth rate, the female carries only 2557 eggs which are in the fourth stage of development at the time of migration. Spawning is most intense in Nov. with water temperatures around 5-6 deg C. During the incubation time approximately 54% of the eggs and embryos perish.--Copyright 1972, Biological Abstracts, Inc.
W72-14758

GROWTH, MATURATION AND FECUNDITY OF THE SAKHALIN ISLAND RIVER CHAR (SALVELINUS ALPINUS), (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
O. F. Gritsenko.
Vopr Ikhtiol. Vol 11, No 4, p 664-677. 1971. Illus.
Identifiers: *Trout, Fish populations, Char, Fecundity, *Growth rates, Maturation, *Salmon, *Sakhalin Island, Salvelinus alpinus, USSR.

Growth, maturation and fecundity of the char (Salvelinus alpinus) in the rivers of Sakhalin Island were investigated in view of the decrease in the numbers of Pacific salmon (genus Oncorhynchus) whose larva and young serve as food for char. The studies were conducted from Aug. 1961 to Oct. 1966. The results showed that the rate of growth, maturity and fecundity was greater in the rivers well supplied with a population of salmon. In general, the river char was similar in its characteristics to the migratory char. The char encountered in the rivers of Sakhalin Island show the highest fecundity due to the abundance of salmon young and larva which provide adequate food during its relatively short life span and thereby assures more rapid maturation and more frequently repeated spawning.--Copyright 1972, Biological Abstracts, Inc.
W72-14767

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-14932

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WASHINGTON STATE'S WATER,
Washington State Water Research Center, Pullman.
D. C. Flaherty.
1971. 45 P, 12 REF.

Descriptors: *Water resources development, *Hydrology, *Washington, *Projects, *Publications, Reviews, Groundwater, Surfaces, Water demand, Water utilization, Water pollution, Water balance, Evapotranspiration, Trees.

The hydrologic work that was completed in the State of Washington during the 1971 fiscal year and some work that was in progress after June 30, 1971 are described. Reports are included that were made during that period or have been published since. These reports are: If the Pump Runs Dry; Basic Studies; As the River Goes, Parking Lots and Forests; The Lake Wreckers; Do Trees Waste Water; Early Warning of Ground-water pollution; What Price Water; Models and Water Quality; and The Public and Water Planning. (Woodard-USGS)
W72-14618

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

INFORMATION SOURCES ON WATER QUALITY INCLUDING THERMAL POLLUTION.
For primary bibliographic entry see Field 05G.
W72-14406

10C. Secondary Publication AND Distribution

DDT IN WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-14431

COMPOSITION OF FLUID INCLUSIONS,
Geological Survey, Washington, D.C. Geologic Div.
For primary bibliographic entry see Field 02K.
W72-14519

ANNOTATED BIBLIOGRAPHY ON GREAT LAKES HYDROLOGY,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02H.
W72-14681

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Kaiser Refractories Environmental Studies, Final Report: 1 June 1971,
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Diurnal Changes in the Schooling Behavior of Certain Species of Lake Baikal Fishes,
W72-14529 2H

BIOSPHERICS INC., ROCKVILLE MD. (ASSIGNEE).
Method for Increasing Oxygen Availability in Sewage Treatment,
W72-14468 5D

BIRLA INST. OF TECH. AND SCIENCE, PILANI (INDIA).
Autecological Studies on Rajasthan Desert Plants: III. Seed Output and Germination in Trianthema Portulacastrum L.,
W72-14857

BOLOGNA UNIV. (ITALY). INSTITUTO DI ZOOLOGIA; AND LABORATORIO DI BIOLOGICA MARINE E PESCA, FANO (ITALY).
A Third Year of Observations on the Contribution of Nutrient Salts of Some Watercourses Flowing into the Adriatic,
W72-14822 5B

BOOTHEEL REGIONAL PLANNING COMMISSION, MALDEN, MO.
Revised Water and Sewer Study.
W72-14442 6D

BORDEAUX UNIV. (FRANCE). LAB. OF BOTANY.
Hydrobiology of Southeastern Lakes: Physicochemical Characteristics of the Waters,
W72-14825 5C

BRITISH COLUMBIA DEPT. OF RECREATION AND CONSERVATION, CRANBROOK. FISH AND WILDLIFE BRANCH.
Segregation Between Adult Cutthroat Trout (Salmo clarki) and Dolly Varden (Salvelinus malma) in Small Coastal British Columbia Lakes,
W72-14801 2H

BRITISH COLUMBIA RESEARCH COUNCIL, VANCOUVER. DIV. OF APPLIED BIOLOGY.
The Nature and Magnitude of the Effect of Kraft Mill Effluents on Salmon,
W72-14697 5C

BUENOS AIRES UNIV. (ARGENTINA). FACULTAD DE AGRONOMIA Y VETERINARIA.
Effect of Treatments Given to the Grain, on the Growth of Wheat Roots Under Drought Conditions,
W72-14293 3F

BUREAU OF COMMERCIAL FISHERIES, ANN ARBOR, MICH. GREAT LAKES FISHERY LAB.
Effects of Dressing and Cooking on DDT Concentrations in Certain Fish from Lake Michigan,
W72-14695 5C

BUREAU OF COMMERCIAL FISHERIES, BEAUFORT, N.C. CENTER FOR ESTUARINE AND MENHADEN RESEARCH.
Ecological Aspects of Radioactivity in the Marine Environment,
W72-14658 5C

BUREAU OF MINES, LARAMIE, WYO. LARAMIE ENERGY RESEARCH CENTER.
Ion-Exchange, Coordination, and Adsorption Chromatographic Separation of Heavy-End Petroleum Distillates,
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BUREAU OF OUTDOOR RECREATION, DENVER, COLO. MID-CONTINENT REGIONAL OFFICE.
Our Resource Endowment and Outdoor Recreation,
W72-14909 6B

BUREAU OF RECLAMATION, BILLINGS, MONT. REGION 6.
Dust Abatement at Canyon Ferry Lake, Canyon Ferry Unit, Helena-Great Falls Division, Pick-Sloan Missouri Basin Program, Montana (Final Environmental Impact Statement).
W72-14565 4D

BUREAU OF RECLAMATION, DENVER, COLO.
Field Tests of Water Pipe Linings: A Summary of 15th-Year Shasta and 10th-Year Colibran Performance,
W72-14245 8G

Testing Transmission Line Belled Auger Footings,
W72-14246 8D

BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.
Tunnels--Machine Excavation, Rate of Progress, Machine Data.
W72-14960 8E

BUREAU OF RECLAMATION, DENVER, COLO. REGION 7.
Pueblo Dam and Reservoir, Fryingpan-Arkansas Project, Colorado (Draft Environmental Impact Statement).
W72-14753 8A

BUREAU OF RECLAMATION, SACRAMENTO, CALIF. WATER AND POWER CONTROL DIVISION.
Optimum Operations Model for Shasta-Trinity System,
W72-14384 4A

BUREAU OF SPORT FISHERIES AND WILDLIFE, WASHINGTON, D.C.
Efficacy, Toxicity, and Residues of Nifurpirinol in Salmonids,
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CALIFORNIA INST. OF TECH., PASADENA. ENVIRONMENTAL QUALITY LAB.
Energy Use in California: Implications for the Environment,
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CALIFORNIA STATE DEPT. OF WATER RESOURCES, LOS ANGELES. SOUTHERN DISTRICT.
Saltwater Intrusion Extraction Barrier,
W72-14204 2F

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, SACRAMENTO.
A Water Quality Model for a Portion of the North Carolina Piedmont,
W72-14641 5B

CALIFORNIA UNIV., BERKELEY.
Well Logs Predict Drillability, Aid Computers,
W72-14487 8G

Further Studies of the Relation of Physical Properties of Rock to Rock Drillability,
W72-14832 8E

CALIFORNIA UNIV., BERKELEY. COLL. OF ENGINEERING.
River Mouth and Beach Sediments -- Russian River, California to Rouge River, Oregon. Part A, Introduction and Grain Size Analyses,
W72-14371 2J

CALIFORNIA UNIV., BERKELEY. HYDRAULIC ENGINEERING LAB.
Field and Laboratory Studies-Navigation Channels of the Columbia River Estuary,
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CALIFORNIA UNIV. MEDICAL CENTER, SAN FRANCISCO. RADIOACTIVITY RESEARCH CENTER.
Risks of Radioactive Pollution of the Oceans,
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CALIFORNIA UNIV., RICHMOND. SANITARY ENGINEERING RESEARCH LAB.
Living with out Wastes,
W72-14901 5G

CALIFORNIA UNIV., RIVERSIDE.
An Interpretation of Reservoir Sedimentation. II. Clay Mineralogy,
W72-14944 2J

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA. INST. OF GEOPHYSICS AND PLANETARY PHYSICS.
Quartz Crystals as Multipurpose Oceanographic Sensors - I. Pressure,
W72-14330 7B

CANADIAN INDUSTRIES, LTD., MONTREAL (QUEBEC). ENGINEERING DEPT.
Water Pollution Surveys as a Guide to Industrial Pollution Control,
W72-14707 5A

Biological Monitoring of the Effluent from a Large Chemical Works in a River Which has Sources of Pollution Upstream,
W72-14713 5A

CENTRAL ELECTRICITY GENERATING BOARD, RATCLIFFE-ON-SOAR (ENGLAND). FRESHWATER BIOLOGY UNIT.
The Ecology of Some British Rivers in Relation to Warm Water Discharges from Power Stations,
W72-14319 5C

CENTRAL NAUGATUCK VALLEY REGIONAL PLANNING AGENCY, WATERBURY, CONN.
The Professional Urban Planner,
W72-14894 6B

CENTRAL PUBLIC HEALTH ENGINEERING RESEARCH INST., NAGPUR (INDIA).
Waste Treatment at a Synthetic Drug Factory in India,
W72-14848 5E

CENTRE NATIONAL DE'ETUDES POUR LA PROTECTION DES ALIMENTS, MATERIAUX ET ETRES VIVANTS.
The Elimination of the Hydrocarbons in the Sea, (Elimination Des Hydrocarbures En Mer),
W72-14655 5G

CH2M-HILL, RESTON, VA.
Physical-Chemical Techniques for Treatment of Raw Wastewaters,
W72-14890 5D

CHURCH (M.) DRILLING CO., MURRAY, UTAH.
Mud Pressure Aids Cable-Tool Drilling,
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CINCINNATI UNIV., OHIO. ENVIRONMENTAL HEALTH ENGINEERING.
Evolving Social Attitudes on Pollution Control,
W72-14936 5G

CLEMSON UNIV., S. C. DEPT. OF TEXTILES.
State of the Art of Textile Waste Treatment.
W72-14827 5D

COAST GUARD, WASHINGTON, D.C.
Test to Determine the Combined Effects of Waves and Currents on Barrier Motions and Oil Retention Efficiency in Rough Water. Point Conception, Cal. (Final Environmental Impact Statement).
W72-14937 5G

COE COLL., CEDAR RAPIDS, IOWA.
Economic Growth and Environmental Costs,
W72-14913 6G

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
Measurements of Ultrasonic Wave Velocities in Ice Cores from Greenland and Antarctica,
W72-14521 2C

An Earth Fill Dam on Permafrost: Hess Creek Dam, Livengood, Alaska,
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Glaciological Investigations in Antarctica,
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COLORADO HOUSE OF REPRESENTATIVES, DENVER.
A Citizen's Comments on Conservation,
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COLORADO OPEN SPACE FOUNDATION, DENVER.
Urban Open Space: Psycho-Socio and Legal Dimensions,
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COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ECONOMICS.
The Economic Value of Water: Concepts and Empirical Estimates,
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COLORADO STATE UNIV., FORT COLLINS. DEPT. OF FISHERY AND WILDLIFE BIOLOGY.
Four Problem Areas,
W72-14908 5C

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF GEOLOGY.
Experimental Study of Channel Patterns,
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COLORADO STATE UNIV., FORT COLLINS. DEPT. OF MICROBIOLOGY.
Microbial Uptake of Lead,
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COLORADO STATE UNIV., FORT COLLINS. DEPT. WATERSHED SCIENCE.
Preliminary Studies in the Terrestrial Disposition of Silver From Cloud Seeding,
W72-14953 5B

COLORADO UNIV., BOULDER.
Effective Pollution Control in Industrialized Countries: International Economic Disincentives, Policy Responses, and the Gatt,
W72-14426 5G

Boulder, Colorado: A Study in Growth,
W72-14912 3D

COLORADO UNIV., BOULDER. DEPT. OF GEOLOGICAL SCIENCES.
Coarse Sediment Transport by Flood Flows on Knik River, Alaska,
W72-14207 2J

COLUMBIA UNIV., NEW YORK. DEPT. OF MECHANICAL ENGINEERING.
A High Pressure Optical Cell for Study of Biochemical Solutions,
W72-14345 2K

COLUMBIA UNIV., PALISADES, N.Y. LAMONT-DOHERTY GEOLOGICAL OBSERVATORY.
Radium--228 Profile at the Second Geosecs Intercalibration Station, 1970, in the North Atlantic,
W72-14532 2K

COMMITTEE ON THE PEACEFUL USES OF THE SEA BED AND THE OCEAN FLOOR BEYOND THE LIMITS OF NATIONAL JURISDICTION (UN), NEW YORK.
Peaceful Uses of the Sea-Bed.
W72-14788 6E

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF PLANT INDUSTRY.
A Semi-Automatic Gate to Improve the Sensitivity of the Crump Weir at Low Flows,
W72-14947 8C

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CRONULLA (AUSTRALIA). DIV. OF FISHERIES AND OCEANOGRAPHY.
The Electrochemical Characteristics of Natural Redox Cells,
W72-14957 2K

COMPAGNIE D'ETUDES ET DE RECHERCHE DES SERVICES OPERATIONNELS D'ASSAINISSEMENT EN FRANCE.
Sewage Treatment Plants,
W72-14459 5D

CONNECTICUT AGRICULTURAL EXPERIMENTAL STATION, NEW HAVEN.
Waste Water Renovation in Connecticut Soils,
W72-14863 5D

CONNECTICUT UNIV., STORRS.
Changes in Resistance to Flow of Water through a Soil-Plant System,
W72-14523 3F

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
Air Oxidation of Organic Compounds in Aqueous Systems,
W72-14836 5D

Measurement and Analysis of Natural-Type Surface Roughnesses Affecting Fluid Flow,
W72-14837 8B

The Velocity Dependence of the Total Cross Section for Alkali-Water Scattering,
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Relative Pollution Strengths of Undiluted Waste Materials Discharged in Households and the Dilution Waters Used for Each,
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Water Quality Control with Synthetic Polymeric Flocculants: Effect of Metal Ions on Flocculation of Biocolloids,
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A Chemical Analysis of the Earthy-Musty Odor in Water,
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Interrelation of the Morphology and Physiology of a Plant and the Resistance to Flow of Water within a Plant,
W72-14842 2I

Solubilizing Effects of Amide-Water Mixtures,
W72-14843 5A

CONSIGLIO NAZIONALE DELLE RICERCHE, ROME (ITALY). INST. FOR WATER RESEARCH.
Preliminary Note on the Formulation of Mathematical Models for the Study of Non-Linear Flows in Aquifers,
W72-14598 2F

CORNELL UNIV., ITHACA, N.Y. DEPT. OF ENTOMOLOGY.
Residues in Fish, Wildlife, and Estuaries. A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-14298 5C

CORNELL UNIV., ITHACA, N.Y. LAB. OF SOIL MICROBIOLOGY.
Heterotrophic Nitrification by Arthrobacter sp.,
W72-14328 5C

CORNELL UNIV., ITHACA, N.Y. PESTICIDE RESIDUE LAB.
Gas Chromatographic Determination of Organic Mercury Compounds by Emission Spectrometry in a Helium Plasma,
W72-14636 5A

CORNELL UNIV., ITHACA, N.Y. WATER RESOURCES AND MARINE SCIENCES CENTER.
A Water Quality Management Strategy for the Great Lakes,
W72-14544 5G

CORPS OF ENGINEERS, DAVIS, CALIF. HYDROLOGIC ENGINEERING CENTER.
Use of Systems Analysis in Water Resource Planning,
W72-14391 6B

CORPS OF ENGINEERS, WALTHAM, MASS. NEW ENGLAND DIV.
Scituate Harbor, Scituate Massachusetts (Final Environmental Statement).
W72-14263 4A

Maintenance Dredging, Scituate Harbor, Massachusetts (Draft Environmental Statement).
W72-14264 4A

Small Navigation Project, Andrews River, Harwich, Massachusetts (Final Environmental Impact Statement).
W72-14276 4A

New Bedford and Fairhaven Harbor, Massachusetts (Final Environmental Impact Statement).
W72-14277 4A

Trumbull Lake, Pequonnock River, Trumbull, Connecticut (Updated Final Environmental Impact Statement).
W72-14278 8A

Scituate Harbor, Scituate, Massachusetts (Draft Environmental Impact Statement).
W72-14572 4A

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA).
Petroleum: Tar Quantities Floating in the Northwestern Atlantic Taken with a New Quantitative Neuston Net,
W72-14693 5A

DAWSON ENGINEERS, INC., JACKSON, MISS.
A Comprehensive Plan for Waterworks and Sanitary Sewerage Facilities, Ridgeland, Mississippi.
W72-14450 6D

DAYTON UNIV., OHIO. DEPT. OF PHYSICS.
Use of X-Ray Fluorescence to Determine Trace Metals in Water Resources,
W72-14965 5A

DELAWARE GEOLOGICAL SURVEY, NEWARK.
Geology of the Fall Zone in Delaware,
W72-14749 2J

DELAWARE RIVER BASIN COMMISSION, TRENTON, N.J.
Limnological Effects of Simulated Pumped-Storage Operation at Yards Creek,
W72-14280 5C

DEPARTMENT OF AGRICULTURE, ASHBURTON (NEW ZEALAND). WINCHMORE IRRIGATION RESEARCH STATION.
Agriculture Research Division Annual Report, 1970-1971.
W72-14375 3F

DEPARTMENT OF AGRICULTURE, BELTSVILLE, MD.
Well Construction and Water Quality,
W72-14494 5B

DEPARTMENT OF COMMERCE, ROCKVILLE, MD.; AND MARYLAND UNIV., COLLEGE PARK.
Society, Environment, and Technology: Challenge and Opportunity,
W72-14900 6G

DEPARTMENT OF ENERGY, MINES AND RESOURCES, BURLINGTON (ONTARIO). CANADA CENTRE FOR INLAND WATERS.
A Synoptic Study for Evaluating the Role of the Great Lakes,
W72-14719 2H

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, FORT WORTH, TEX. REGION VI.
Water Treatment Facilities, Foss Reservoir, Custer County, Oklahoma (Final Environmental Impact Statement).
W72-14563 5F

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, WASHINGTON, D.C. LAND AND FACILITIES DEVELOPMENT ADMINISTRATION.
Metropolitan Growth -- Encroachment or Orderly Process,
W72-14910 5G

DEPARTMENT OF STATE, WASHINGTON, D.C.
Documents for the U.N. Conference on the Human Environment, Stockholm, June 5-16, 1972--Part III.
W72-14773 6G

DEPARTMENT OF THE AIR FORCE, WASHINGTON, D.C.
Land Outlease for Wastewater Treatment Facilities, Tyndall AFB Florida (Draft Environmental Impact Statement).
W72-14928 5D

DEPARTMENT OF THE ENVIRONMENT, VICTORIA (BRITISH COLUMBIA). MARINE SCIENCES BRANCH (PACIFIC REGION).
Current Velocities in the Vicinity of the Greater Vancouver Sewerage and Drainage District's Iona Island Outfall - 1968,
W72-14657 5B

DEPARTMENT OF THE INTERIOR, WASHINGTON, D.C.
Proposed Closed Basin Division, San Luis Valley Project, Colorado (Draft Environmental Impact Statement).
W72-14573 4B

DESALINATION SYSTEMS, INC., SAN DIEGO, CALIF. (ASSIGNEE).
Water Storage System for Reverse Osmosis Purification Unit,
W72-14996 3A

DETROIT EDISON CO., MICH.
Computer Model for a Thermal Plume,
W72-14407 5B

DEUTSCHE AKADEMIE DER WISSENSCHAFTEN ZU BERLIN, ROSTOCK (EAST GERMANY). INSTITUT FUER MEERESKUNDE.
Investigations into the Distribution of Inorganic Nitrogen Compounds in Relation to the Increasing Deterioration of the Water in the Baltic Sea (Untersuchungen Uber Die Verteilung Der Anorganischen Stickstoffverbindungen I m Hinblick Auf Die Zunehmende Wasserverschlechterung In Der Ostsee),
W72-14674 5B

DEUTSCHES HYDROGRAPHISCHES INSTITUT, HAMBURG (WEST GERMANY).
Research on the Distribution of Radioactive Fall-Out in the Region of the North Sea, Skagerrak and the Western Baltic Sea, (Unter Suchungen Uber Die Verteilung Des Radioaktiven Fallout im Bereich Der Nordsee, De s Skagerraks Und Der Westlichen Ostsee),
W72-14671 5B

DIAMOND ALKALI CO., PAINESVILLE, OHIO.
Feasibility Study of Chemical Sealing of Soils,
W72-15000 5B

DIGITAL PROGRAMMING SERVICES, INC., WALTHAM, MASS.
Research in Numerical Analysis Techniques for Model Simulation,
W72-14358 2B

DUKE UNIV. MEDICAL CENTER, DURHAM, N.C. DEPT. OF PHYSIOLOGY AND PHARMACOLOGY.
The Effect of Chloroform, Phenols, Alcohols and Cyanogen Iodide on the Swelling of Pseudomonas Aeruginosa in Various Salts,
W72-14315 5C

DURHAM UNIV. (ENGLAND). DEPT. OF BOTANY.
Environmental Limits of Plants in Flowing Waters,
W72-14690 5C

Filamentous Algae as Weeds,
W72-14692 5C

Toxicity of Heavy Metals to Freshwater Algae: A Review,
W72-14694 5C

DYNATECH R/D CO., CAMBRIDGE, MASS.
A Survey of Alternate Methods for Cooling Condenser Discharge Water--System Selection, Design, and Optimization.
W72-14724 5D

EAST AFRICAN VETERINARY RESEARCH ORGANIZATION, KABETE (KENYA).
A Method for the Rapid Enumeration of Mycoplasma Species Growing in Broth Culture,
W72-14310 5A

EAST PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY, DACCA.
Water Balance and Flow Study in the Brahmaputra-Ganges Basin of East Pakistan,
W72-14720 2E

EASTERN MICHIGAN UNIV., YPSILANTI. DEPT. OF BIOLOGY.
The Ecology of the Silverjaw Minnow, Ericymba Buccata Cope,
W72-14206 5C

EBASCO SERVICES INC., NEW YORK.
The Capacity of Cooling Ponds to Dissipate Heat,
W72-14398 5D

ECONOMIC RESEARCH SERVICE, MADISON, WIS.
Economic and Legal Factors in Providing, Using, and Managing Water Resources in Agriculture.
W72-14256 3F

EDINBURGH UNIV. (SCOTLAND). SCHOOL OF MEDICINE.
An Evaluation of the Gaspak System in the Culture of Anaerobic Bacteria,
W72-14308 5A

EGYPTIAN DESERT INST., CAIRO.
Graphical Method for Estimating the Transmissibility and Storativity of Aquifers from Specific Capacity of Wells,
W72-14603 2F

EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND).
Some Ecological Points Regarding Water Pollution, (Einige Okologische Gesichtspunkte Beim Gewasserschutz),
W72-14669 5B

ENGINEERING-SCIENCE, INC./TEXAS, AUSTIN.
Preliminary Investigational Requirements-Petrochemical and Refinery Waste Treatment Facilities.
W72-14852 5D

ENTE NAZIONALE PER L'ENERGIA ELECTTRICA, ROME (ITALY).
Quantitative Evaluation of Power System Reliability in Planning Studies,
W72-14241 8C

ENVIRONMENTAL HEALTH LAB., MCCLELLAN AFB, CALIF.
Loss of Mercury from Water During Storage,
W72-14620 5A

ENVIRONMENTAL MEASUREMENTS, INC., SAN FRANCISCO, CALIF.
Monitoring Mercury Vapor Near Pollution Sites.
W72-14714 5A

ENVIRONMENTAL PROTECTION AGENCY, ADA, OKLA. NATIONAL GROUNDWATER RESEARCH PROGRAM; AND ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D. C. WATER QUALITY OFFICE.
Aspects of Aquifer Management,
W72-14876 4B

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO.
Toxicity of Kraft Mill Effluent to Selected Estuarine Organisms from Yaquina Bay, Oregon,
W72-14792 5C

ENVIRONMENTAL PROTECTION AGENCY, DENVER, COLO. REGION VIII.
Lead-Deadwood Sanitary District Number 1, South Dakota (Final Environmental Statement).
W72-14924 5D

ENVIRONMENTAL PROTECTION AGENCY, GULF BREEZE, FLA.
Effects of Mirex on Selected Estuarine Organisms,
W72-14710 5C

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.; AND NEBRASKA STATE DEPT. OF ENVIRONMENTAL CONTROL, LINCOLN.
Water Quality Standards Summary for the Interstate Waters of Nebraska.
W72-14956 5G

ENVIRONMENTAL SCIENCES, INC., BERKELEY HEIGHTS, N.J. (ASSIGNEE)
Process of Clarifying a Liquid Using Scorched Newsprint,
W72-14990 5D

ESSO RESEARCH AND ENGINEERING CO., LINDEN, N.J. (ASSIGNEE).
Oil Water Separation System for Tankers,
W72-14465 5G

FEDERAL HIGHWAY ADMINISTRATION, WASHINGTON, DC, OFFICE OF RESEARCH; AND FEDERAL HIGHWAY ADMINISTRATION, WASHINGTON, D.C. OFFICE OF DEVELOPMENT.
Water Supply and Waste Disposal Series: Volume I. Terminology Standardization and Microbiology.
W72-14363 5B

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, CINCINNATI, OHIO. BIOLOGICAL AND CHEMICAL SECTION.
Assessing Temperature Effects with Biology,
W72-14401 5C

FEDERAL WATER QUALITY ADMINISTRATION, CINCINNATI, OHIO. ADVANCED WASTE 'TREATMENT RESEARCH LAB.
Nitrogen Removal from Wastewaters.
W72-14650 5D

FEDERAL WATER QUALITY ADMINISTRATION, WASHINGTON, D.C.
Conference in the Matter of Pollution of Lake Erie and Its Tributaries-Indiana-Michigan-New York-Ohio-Pennsylvania: Volumes 1 and 2.
W72-14282 5B

FEDERATION INTERNATIONALE DE THALASSOTHERAPIE.
Vital Conditions for the Organization of a Thalassotherapie Center to Facilitate Industrial

Management of the Littoral, (Conditions Indispensables Pour L'Organisation D'Un Centre De Thalassotherapie En Fonction De L'Amenagement Industriel Du Littoral),
W72-14654 5C

FISCHER AND PORTER CO., WARMINSTER, PA. (ASSIGNEE).
System for Electrochemical Water Treatment,
W72-14455 5D

FISHERIES RESEARCH BOARD OF CANADA, HALIFAX (NOVA SCOTIA).
Tissue Culture Bioassay Method for Water Pollution with Special Reference to Mercuric Chloride,
W72-14700 5A

FISHERIES RESEARCH BOARD OF CANADA, HALIFAX (NOVA SCOTIA). HALIFAX LAB.
Distribution of Clostridium Botulinum Type E in the Gulf of St. Lawrence in Relation to the Physical Environment,
W72-14325 5C

FISHERIES RESEARCH BOARD OF CANADA, NANAIMO (BRITISH COLUMBIA). BIOLOGICAL STATION.
Likelihood Analysis of Three-Way Contingency Tables,
W72-14346 7C

FISHERIES RESEARCH BOARD OF CANADA, ST. ANDREWS (NEW BRUNSWICK). BIOLOGICAL STATION.
Histological Changes in Lobsters (Homarus Americanus) Exposed to Yellow Phosphorus,
W72-14284 5C

FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.; AND NORTH DAKOTA STATE UNIV., FARGO.
The Dependence of Primary Production Upon Physical and Chemical Factors in a Small, Senescing Lake, Including the Effects of Complete Winter Oxygen Depletion,
W72-14806 5C

FLORIDA DEPT. OF COMMUNITY AFFAIRS, TALLAHASSEE. TECHNICAL ASSISTANCE DIV.
Sanitary Waste Water Treatment and Disposal as Related to Development--Lake County, Florida.
W72-14383 5D

FLORIDA STATE UNIV., TALLAHASSEE. SEDIMENTOLOGICAL RESEARCH LAB.
A Sedimentologic Study of Mobile Bay, Alabama,
W72-14524 2L

A Sedimentologic Study of Perdido Bay and Adjacent Offshore Environments,
W72-14615 2L

FLORIDA UNIV., GAINESVILLE. COLL. OF LAW.
Jetport: Planning and Politics in the Big Cypress Swamp,
W72-14548 6G

The Tennessee Water Quality Control Act of 1971,
W72-14781 5G

FMC CORP., SAN JOSE, CALIF. (ASSIGNEE).
Method and Apparatus for Treating Waste Materials,
W72-14983 5D

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). EUROPEAN INLAND FISHERIES ADVISORY COMMISSION.
Water Quality Criteria for European Freshwater Fish, Report on Monohydric Phenols and Inland Fisheries.
W72-14698 5C

FOOD AND DRUG ADMINISTRATION, BROOKLYN, N.Y.
Fluorescent Spectrophotometry in the Identification of Bacteria,
W72-14311 5A

FOOD AND DRUG ADMINISTRATION. CINCINNATI, OHIO.
Levels of Antimony, Cadmium, Chromium, Cobalt, Manganese, and Zinc in Institutional Total Diets,
W72-14622 5A

FOOD AND DRUG ADMINISTRATION, ROCKVILLE, MD. BUREAU OF DRUGS.
Toxic Effects of Cadmium: A Review,
W72-14621 5C

FORESTRY DEPT., SANDAKAN (MALAYSIA). RESEARCH BRANCH.
Natural Regeneration of the Kambui Hills Forest in Eastern Sierra Leone: I. Ecological Status of the Lophira/Heritiera Rain Forest,
W72-14696 4A

FORT HOWARD PAPER CO., GREENBAY, WIS. (ASSIGNEE).
Process for Reduction of Water Pollution Due to Domestic and Industrial Wastes,
W72-14992 5D

FRESHWATER BIOLOGICAL ASSOCIATION, AMBLESIDE (ENGLAND).
The Ecology of Morecambe Bay. IV. Invertebrate Drift into and From the River Leven,
W72-14339 5C

Grazing by the Ciliated Protozoon Loxodes Magnus on The Alga Scenedemus in a Eutrophic Pond,
W72-14796 5C

The Toxicity of Microcystis Aeruginosa Kutz from Some English Reservoirs,
W72-14824 5C

FRESHWATER FISHERIES LAB., PITLOCHRY (SCOTLAND).
The Effects of Pesticides on Life in Fresh Waters,
W72-14320 5C

FRESNO STATE COLL., CALIF.
Atmospheric Water Resources Research,
W72-14232 3B

GEA-GESELLSCHAFT FUER LUFTKONDENSATION M.B.H., BOCHUM (WEST GERMANY).
Economics and Operating Experience with Air-Cooled Condensers,
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Experimental Investigations on the Activity of Bacteria in Relation to the Metabolism of Nitrogen Compounds in Gravel-Pit Lakes (Experimentelle Untersuchungen Ueber Die Aktivitaet Von Barterien Beim Vmsatz Von N-Verbindungen in Baggerseen),
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The Identification of Streptococci by Gas-Liquid Chromatography,
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MARYLAND UNIV., COLLEGE PARK. WATER RESOURCES RESEARCH CENTER.
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The Potential, the Problems, and the Status of Using Proteins of Aquatic Origin as Human Food,
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Mercury Pollution: The Making of an Environmental Crisis,
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Characteristics, Classification and Incidence of Plumes from Large Natural-Draft Cooling Towers,
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Paleozoic Sandstone Aquifers in Saudi Arabia,
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MINISTRY OF AGRICULTURE, FISHERIES AND FISHERIES AND FOOD, BURNHAM-ON-CROUCH (ENGLAND). FISHERIES LAB.
The Toxicity of 140 Substances to the Brown Shrimp and Other Marine Animals.
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MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, BURHHAM-ON-CROUCH (ENGLAND). FISHERIES LAB.
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MINISTRY OF WATER AND POWER, TEHRAN (IRAN). DIV. OF GROUNDWATER.
Estimating the Transmissivity of Aquifers From the Formation Conductance,
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MINISTRY OF WORKS, HAMILTON (NEW ZEALAND). WATER AND SOIL DIV.
Adair IHD Experimental Basin No 14, 1970.
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MINNESOTA UNIV., BENSON. AGRICULTURAL EXTENSION SERVICE.
An Evaluation of Irrigation Potential in the Bonanza Valley,
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MINNESOTA UNIV. MINNEAPOLIS. DEPT. OF ECOLOGY AND BEHAVIORAL BIOLOGY.
Chlorination of Power Plants: Impact on Phytoplankton Productivity,
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MINNESOTA UNIV., MINNEAPOLIS. LIMNOLOGICAL RESEARCH CENTER.
Stratigraphic Record of Pollution in Shagawa Lake, Northeastern Minnesota,
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MINNESOTA UNIV., MINNEAPOLIS. WATER RESOURCES RESEARCH CENTER.
Water Resources Administration in Minnesota - 1972,
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Proceedings of Conference on Inland Lake Renewal and Shoreland Management,
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The 1969 Upper Mississippi River Dredge Spoil Survey From Hastings, Minnesota to Cairo, Illinois,
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Wells and Streams: Relationship at Law,
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A Review of On-Site Domestic Sewage Treatment Processes and System Alternatives,
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Future Effects of Weather Modification on Streamflow, Upper Missouri River Basin,
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MONTANA STATE UNIV., BOZEMAN. WATER RESOURCES RESEARCH CENTER.
Social Impact of the Libby Dam-Lincoln County, The Case of Absentee or Extra-Local Influence,
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MONTGOMERY COUNTY SANITARY DEPT., DAYTON, OHIO.
Ground Water Infiltration and Internal Sealing of Sanitary Sewers.
W72-14441 5G

MONTREAL UNIV. (QUEBEC). FACULTE DE PHARMACIE.
Reduction of the 20-Carbonyl Group of C-21 Steroids by Spores of Fusarium Solani and Other Microorganisms. I. Side-Chain Degradation, Epoxide Cleavage, and Substrate Specificity,
W72-14300 5C

MOSCOW STATE UNIV. (USSR).
The Assimilation of Monocarbon Compounds by Pseudomonas Sp. 2,
W72-14335 5C

MOSCOW STATE UNIV. (USSR); AND INSTITUT NEFTEKHIMICHESKOI I GAZOVOI PROMYSHLENNOST, MOSCOW (USSR).
The Effect of Compounds Containing Amino Groups on Microbial Growth in the Medium with Oil Fuel, (In Russian),
W72-14334 5C

MOSS LANDING MARINE LABS., CALIF.
Kaiser Refractories Environmental Studies, Final Report: 1 June 1971,
W72-14656 5C

MOSS (ROSCOE) CO., PHOENIX, ARIZ.
Mud-Scow Drilling,
W72-14495 8C

MUNICH UNIV. (WEST GERMANY). METEOROLOGISCHES INSTITUT.
Water and Energy Balances of Different Vegetation Covers,
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Preliminary Results of New Investigations of World's Water Balance,
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MUNICH UNIV. (WEST GERMANY). ZOOLOGISCH-PARASITOLOGISCHES INSTITUT.
Methods of Fish Research Concerning the Effects of Waste Water Poisons, (Methodik der Fischuntersuchungen im Hinblick auf die Wirkung von Abwassergiften),
W72-14665 5C

NATIOANL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ROCKVILLE, MD.
Remote Sensing of Sea Surface Temperature from Earth Satellites,
W72-14531 7B

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, MOFFETT FIELD, CALIF. AMES RESEARCH CENTER.
Isolation and Characterization of Ultraviolet Light-Sensitive Mutants of the Blue-Green Alga Anacystis Nidulans,
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D.C.
Specialized Hologen Generator for Purification of Water,
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NATIONAL ALUMINATE CORP., CHICAGO, ILL.
A New Index for Determining Amount of Calcium Carbonate Scale Formed by a Water,
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NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C. INST. FOR MATERIALS RESEARCH.
Use of Fiber Optics in the Study of Chemiluminescent Reactions,
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NATIONAL CANNERS ASSOCIATION, BERKELEY, CALIF. WESTERN RESEARCH LAB.
Reconditioning of Food Processing Brines.
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NATIONAL COMMISSION ON AGRICULTURE, NEW DELHI (INDIA).
Study of pH and Eh Changes of Waterlogged Soil and in Pure Systems,
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Microbiology-Detection and Occurrence of Viruses,
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NATIONAL INST. FOR WATER RESEARCH, CONGELLA (SOUTH AFRICA). REGIONAL LAB.
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NATIONAL LEAD CO., HOUSTON, TEX. BAROID DIV.
New Fast-Drilling Muds Also Provide Hole Stability,
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NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH. BIOLOGICAL LAB.
Subsurface Water Temperatures of the Columbia River at Prescott, Oregon (River Mile 72), 1968-69,
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NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WASH. NORTH PACIFIC FISHERIES RESEARCH CENTER.
Increased Predation by the Torrent Sculpin, Cottus rhotheus, on Coho Salmon Fry, Oncorhynghus kisutch, During Moonlight Nights,
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NATIONAL PARK SERVICE, WESTERN REGIONAL OFFICE. SAN FRANCISCO, CALIF.
The Plan for Recreation Development,
W72-14421 6B

NATIONAL RESEARCH CENTER FOR DISASTER PREVENTION, TOKYO (JAPAN).
Dispersion of Groundwater Flow,
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NATIONAL RESEARCH INSTITUTE OF AGRICULTURAL ENGINEERING, HIRATSUKA (JAPAN).
Prospecting of Underground Water by the Measurement of Natural Radioactivity,
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NATIONAL TECHNICAL UNIV., ATHENS (GREECE); AND PUBLIC POWER CORP., ATHENS (GREECE).
Effect of Size of Reservoir on Hydro Project Cost,
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NATIONAL WATER QUALITY LAB., DULUTH, MINN.
Effects of Long-Term Exposure to Carbaryl (Sevin) on Survival, Growth, and Reproduction of the Fathead Minnow (Pimephales Promelas),
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NATIONAL WEATHER SERVICE, COLUMBIA, S.C.
Forecasting Precipitation Type at Greer, South Carolina,
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NATURE CONSERVANCY, NORWICH (ENGLAND). COASTAL ECOLOGY RESEARCH STATION.
The Ecology of Morecambe Bay. II. Intertidal Invertebrates and Factors Affecting Their Distribution,
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NAVAL ACADEMY, ANNAPOLIS, MD.
Industrial Feasibility of Manmade Islands Constructed from the Offshore Disposal of Dredged Spoil,
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Transportable Breakwaters-A Survey of Concepts,
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NAVAL OCEANOGRAPHIC OFFICE, WASHINGTON, D.C.
Vertical Mixing of Ice-Rafted Volcanic Ash in North Atlantic Sediments,
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Sediment Redistribution on the Reykjanes Ridge: Seismic Evidence,
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Field Observations of Wave Runoff on a Sand Beach,
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The Vortex Principle: A Method for Concentrating Materials From a Liquid Phase,
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Evaluation of Warm-Fog Abatement Chemicals,
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NEBRASKA UNIV., LINCOLN. DEPT. OF CIVIL ENGINEERING.
BOD Determinations on Feedlot Runoff,
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Eutrophication of Small Reservoirs in the Great Plains,
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Physiological and Biochemical Responses of Plants to Different Internal Water Potentials,
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A Survey of the Phreatophytic Trees of the Republican River Valley, Nebraska,
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NEVADA UNIV., RENO. CENTER FOR WATER RESOURCES RESEARCH.
Optimum Reservoir Operation Using Stochastic Dynamic Programming,
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Development and Management of Ground Water and Related Environmental Factors in Arid Alluvial and Carbonate Basins in Southern Nevada,
W72-14916 4B

NEW ENGLAND RIVER BASINS COMMISSION, BOSTON, MASS.
Connecticut River Basin Plan for Comprehensive Development (Draft Environmental Impact Statement).
W72-14751 8A

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF BIOCHEMISTRY.
Chemical Studies on Toxins From Gymnodinium Breve and Aphanizomenon Flos-Aquae,
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NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF SOIL AND WATER SCIENCE.
Stomatal Resistance and Transpiration Potential of Bog Plants,
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NEW HAMPSHIRE UNIV., DURHAM. WATER RESOURCES RESEARCH CENTER.
The Analysis of Aromatic Compounds in Water Using Fluorescence and Phosphorescence,
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NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO.
Horizontal Wells and Drains,
W72-14500 8B

NEW MEXICO STATE ENGINEER, SANTA FE.
Bibliography of Ground-Water Studies in New Mexico.
W72-14938 2F

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRICULTURAL ENGINEERING.
Optimizing Furrow Streams to Predict Irrigation System Efficiencies,
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NEW MEXICO STATE UNIV., UNIVERSITY PARK. ENGINEERING EXPERIMENT STATION.
A Method of Demineralization Using Strongly Ion Exchange Resins,
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NEW MEXICO STATE UNIV., UNIVERSITY PARK. WATER RESOURCES RESEARCH INST.
Pollution Studies of the Regional Ogallala Aquifer at Portales, New Mexico,
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Fluctuations in Nitrate Concentrations Utilized as an Assessment of Agricultural Contamination to an Aquifer of a Semiarid Climatic Region,
W72-14435 5B

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA.
Wastes Generated in the Manufacture of Sauerkraut,
W72-14847 5D

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ROME. ROME POLLUTION LAB.
Mercury: Its Historical Presence in New York State Fishes,
W72-14632 5C

NEW YORK STATE DEPT. OF HEALTH, ALBANY. DIV. OF PURE WATER.
Industrial Wastewater Discharges.
W72-14444 5A

NIPPON RENSUI KABUSHIKI KAISHA (JAPAN).
Counterflow, Moving Bed Type, Ion Exchange Apparatus,
W72-14986 3A

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF PLANT PATHOLOGY.
Animal Toxicity of Phytopathogenic Fungi,
W72-14299 5C

NORTH CAROLINA UNIV., CHAPEL HILL.
The Council on Environmental Quality: An Evaluation,
W72-14895 6E

NORTH CAROLINA UNIV., CHAPEL HILL. CENTER FOR URBAN AND REGIONAL STUDIES.
Vacation Home Location: A Model for Simulating the Residential Development of Rural Recreation Areas,
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NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF CITY AND REGIONAL PLANNING.
Planning of Regional Water Resource Systems for Urban Needs,
W72-14638 6D

Relationships between Supplies and Projected Demands for Water in a Six-County Urbanizing Region of the North Carolina Piedmont,
W72-14639 6D

Models for the Synthesis of Monthly Streamflows for a Portion of the North Carolina Piedmont,
W72-14640 2E

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF GEOLOGY.
Deep Erosion by Continental Ice Sheets,
W72-14208 2J

NORTH PACIFIC FISHERIES INST., SAPPORO (JAPAN).
Notes on Biological Characteristics and Migration of the Masu Salmon. Oncorhynchus Masou (Brevoot), In the Offshore Areas of the West Coast of Kamchatka Peninsula, (In Japanese),
W72-14295 8I

NOVA SCOTIA DEPT. OF MINES, HALIFAX.
Air Pump for Small-Diameter Piezometers,
W72-14510 8C

OESTERREICHISCHE GESELLSCHAFT FUER METEOROLOGIE, VIENNA (AUSTRIA).
Discoloration of Algal Blooms and Seaweeds (Vegetationsfarbungen und Wasserbluten),
W72-14673 5C

OFFICE OF SALINE WATER, WASHINGTON, D.C.
Transport Property Requirements of Membranes for Use in the Reverse Osmosis Process as Defined by the Method of Irreversible Thermodynamics,
W72-14999 3A

OFFICE OF SALINE WATER, WASHINGTON, D.C.; AND CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Proposed Diablo Canyon Desalting Project (Draft Environmental Statement).
W72-14925 3A

OFFICE OF THE CHIEF OF ENGINEERS (ARMY), WASHINGTON, D.C.
Panama City Harbor, Florida (Final Environmental Impact Statement).
W72-14769 4A

OFFICE OF WATER RESOURCES RESEARCH, WASHINGTON, D.C. WATER RESOURCES SCIENTIFIC INFORMATION CENTER.
DDT In Water, A Bibliography.
W72-14431 5B

OHIO STATE UNIV., COLUMBUS. DEPT. OF GEOLOGY.
Alpine Subnival Boulder Pavements in Colorado Front Range,
W72-14229 2J

OHIO STATE UNIV., COLUMBUS. INST. OF POLAR STUDIES.
Ogive Systems on Polar Alpine Glaciers,
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OHIO STATE UNIV. HOSPITALS, COLUMBUS.
Water Relations in Living, Dead, and Cellulose Models of the Lichen Umbilicaria Papulosa,
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OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS.
Research on and Culture of Calcareous Green Algae,
W72-14294 5C

OIL WELL RESEARCH, INC., LOS ANGELES, CALIF.
Testing and Evaluating Lost Circulation Materials,
W72-14490 8G

OKLAHOMA STATE UNIV., STILLWATER. BIOENVIRONMENTAL ENGINEERING LABS.
Water Resources Planning Studies Oklahoma and Arkansas, Phase II (Quality),
W72-14432 5G

OKLAHOMA UNIV., NORMAN.
Five Factors that Affect Drilling Rate,
W72-14478 8B

Problems Associated with Design Programs for Air and Gas Drilling,
W72-14479 8C

Effect of Bit Weight on Drilling Rate,
W72-14482 8C

Effect of Rotary Speed on Drilling Rate,
W72-14483 8C

OKLAHOMA WATER RESOURCES RESEARCH INST., STILLWATER.
Recreational Use of an Oklahoma Scenic River Bisected by a Flood Control-Hydroelectric Impoundment (Revised),
W72-14917 6B

OMAHA METROPOLITAN UTILITIES DISTRICT, NEBR.
Omaha's Platte River Water Treatment Plant,
W72-14887 5D

OREGON STATE UNIV., CORVALLIS.
Economics of Hatchery Salmon Disposal in Oregon,
W72-14423 6C

OREGON STATE UNIV., CORVALLIS. DEPT. OF CIVIL ENGINEERING.
Comments on 'Nonlinear Programming Applied to Regional Water Resources Planning' by G. K. Young and M. A. Pisano,
W72-14385 6A

OREGON STATE UNIV., CORVALLIS. DEPT. OF FOREST ENGINEERING.
An Improved Temperature Prediction Model for Small Streams,
W72-14920 2E

OREGON STATE UNIV., CORVALLIS. DEPT. OF OCEANOGRAPHY.
Relative Significance of Head and Body Spill from a Channelized Turbidity Current,
W72-14216 2J

OREGON STATE UNIV., CORVALLIS. WATER RESOURCES RESEARCH INST.
Methylation of Mercury by Microorganisms,
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OSAKA CITY UNIV. (JAPAN).
Water Quality Problem in Eastern Osaka, Japan,
W72-14606 2F

OTTAWA UNIV. (ONTARIO). DEPT. OF GEOLOGY.
Geochemistry of Ferromanganese Oxide Concretions and Associated Deposits in Lake Ontario,
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OWENS-ILLINOIS, INC., TOLEDO, OHIO. (ASSIGNEE).
Aeration Apparatus,
W72-14454 5G

PACIFIC GAS AND ELECTRIC CO., EMERYVILLE, CALIF. ENGINEERING RESEARCH DEPT.
Thermal Discharge: A Model-Prototype Comparison,
W72-14393 5B

PACIFIC NORTHWEST RIVER BASINS COMMISSION, VANCOUVER, WASH.
Puget Sound and Adjacent Waters Comprehensive Plan (Draft Environmental Statement).
W72-14558 6G

PALLI SIKSHA SADANA, SRINIKETAN (INDIA).
Mechanism of the Formation of Exchangeable Ammonium Nitrogen Immediately After Waterlogging of Rice Soils,
W72-14287 2G

PAN AMERICAN PETROLEUM CORP., TULSA, OKLA.
Drilling Optimization,
W72-14475 8C

PEAT, MARWICK, MITCHELL AND CO., HARTFORD, CONN.
Water Supply Management Study for the Southeastern Connecticut Regional Planning Agency.
W72-14449 6E

PENNSYLVANIA STATE UNIV., MIDDLETOWN, PA. CAPITOL CAMPUS.
Induction-Tuned Method to Determine Casing Lengths in Hydrogeologic Investigations,
W72-14501 8B

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF MATERIAL SCIENCES.
Adsorption Characteristics of Coals and Chars,
W72-14814 5D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
Water Resources Applications of Stream Channel Characteristics on Small Forested Basins,
W72-14966 2A

PENNSYLVANIA UNIV., PHILADELPHIA. ELECTROCHEMISTRY LAB.
On the Deposition and Dissolution of Zinc in Alkaline Solutions,
W72-14322 5B

PENNWALT CORP., WARMINSTER, PA. (ASSIGNEE).
Water Treatment,
W72-14973 5F

PIONEER CENTRIFUGING CO., HOUSTON, TEX.
Desilting Muds with Hydroclones,
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PLASTIC PIPE INST., SILVER SPRING, MD.
Recent Developments in Thermoplastic Piping,
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PNEUMATIQUES, CAOUTCHOUC MANUFACTURE ET PLASTIQUES KLEBER-COLOMBES (FRANCE). (ASSIGNEE).
Floating Barrier Means,
W72-14971 5G

POLISH ACADEMY OF SCIENCES, WARSAW. INST. OF ECOLOGY.
The Influence of Experimental Increase of Biomass of the Blue-Green Algae Gloeotrichia Echinulata (Smith) Richter on Phytoplankton Production,
W72-14812 5C

POLISH ACADEMY OF SCIENCES, WARSAW. INST. OF ECOLOGY; AND POLISH ACADEMY OF SCIENCES, WARSAW. DEPT. OF HYDROBIOLOGY.
The Influence of Various Concentrations of Natural Food on the Development, Fecundity and Production of Planktonic Crustacean Filtrators,
W72-14799 5C

POMONA COLL., CLAREMONT, CALIF. DEPT. OF GEOLOGY.
Significance of Supratidal Dolomitization in the Geologic Record,
W72-14226 2J

PORT AUTONOME DE MARSEILLE (FRANCE).
Marselle-FOS: The Equipment for a Sea Shore; The Stability to Preserve, (Marseille-FOS: L'Equipment D'une Facade Maritime; Les Equilibres a Pre-server),
W72-14652 5G

PRINCETON UNIV., N.J. DEPT. OF GEOLOGICAL AND GEOPHYSICAL SCIENCES.
Iron and Clay in Tropical Savanna Alluvium, Northern Colombia: A Contribution to the Origin of Red Beds,
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PUBLIC UTILITIES, MANKATO, MINN.
A Case History in Ground Water Collection,
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PUERTO RICO UNIV., MAYAGUEZ. WATER RESOURCES RESEARCH INST.
A Study of the Cost and Effects of Irrigation in the Planning and Implementation of the Lajas Valley Agricultural Development Program,
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Analysis and Hybrid Computer Simulation of Multiconductor Transmission Systems,
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PURDUE UNIV., LAFAYETTE, IND. DEPT. OF CIVIL ENGINEERING.
Computer Simulation of Activated Sludge Plant Operation,
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PURDUE UNIV., LAFAYETTE, IND. DEPT. OF GEOSCIENCES.
Development of Alluvial Stream Channels: A Five-Stage Model,
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PURETEST WATER PURIFYING CO. (ASSIGNEE).
Fail-Safe Water Purifying Apparatus,
W72-14456 5F

QATER PETROLEUM CO. LTD., UMM SAID.
Evaluation of Limestone Formation Characteristics from Well Logs,
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QUEENS UNIV., BELFAST (NORTHERN IRELAND). DEPT. OF GEOGRAPHY.
Some Movement Patterns of Temperate Mudflows: Examples from Northeastern Ireland,
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RAND CORP., SANTA MONICA, CALIF.
A Cost Analysis of Waste Management in the Steel Industry,
W72-14379 5D

Signed Digraphs and the Growing Demand for Energy,
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Effects of Pollution Control on the Firm,
W72-14420 5G

READING UNIV. (ENGLAND). DEPT. OF SOIL SCIENCE.
Nitrate Leaching Under Bare Fallow at a Site in Northern Nigeria,
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READING UNIV. (ENGLAND). DEPT. OF ZOOLOGY.
Quantitative Studies on the Phytoplankton of the Rivers Thames and Kennet at Reading,
W72-14797 5C

REGENSBURG UNIV. (WEST GERMANY).
Apparatus for Continuous Measurement of Active Uptake of Radioactive Substances,
W72-14326 5A

RESEARCH CORP., (ASSIGNEE) NEW YORK.
Method and Apparatus for Treating Waste-Containing Liquor,
W72-14462 5D

RESEARCH INST. FOR NATURAL RESOURCES, TOKYO (JAPAN).
The Productivity of Attached Algae in River, (In Japanese),
W72-14821 5C

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.
Water Resource Management in Northern Mexico,
W72-14389 3F

Man and His Environment: The Issues in Perspective,
W72-14892 6G

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Productivity of the Benthic Microflora of Shoal Estuarine Environments in Southern New England,
W72-14317 5C

RHODE ISLAND UNIV., KINGSTON. NARRAGANSETT MARINE LAB.
Fluoride Chlorinity Ratios in Narragansett Bay,
W72-14813 2L

RICHARDS OF ROCKFORD, INC., ILL. (ASSIGNEE).
Floating Aerator,
W72-14993 5D

ROAD AND RAILWAY CONSTRUCTION NATIONAL CO., PRAGUE (CZECHOSLOVAKIA).
New Trends in Improving Physical Qualities of Rocks,
W72-14239 8D

ROBERT A. TAFT WATER RESEARCH CENTER, CINCINNATI, OHIO. ADVANCED WASTE TREATMENT RESEARCH LAB.
Research to Develop and Demonstrate a Mobile Pilot Plant for Removal of Phosphate from Wastewaters by Adsorption on Alumina,
W72-14789 5D

ROCKEFELLER UNIV., NEW YORK.
Light-Induced Fluorescence Changes in Chlorella, and the Primary Photoreactions for the Production of Oxygen,
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ROHM AND HAAS CO., PHILADELPHIA, PA.
Ion-Exchange System Boasts More Pulling Power,
W72-14816 5D

ROLLINS-PURLE, INC., WILMINGTON, DEL.
Treatment of Industrial Wastes at Regional Facilities,
W72-14854 5D

ROSS, HARDIES, O'KEEFE, BABCOCK, MCDUGALD AND PARSONS, CHICAGO, ILL.
Zoning for Beauty,
W72-14880 6F

RUHRVERBAND, ESSEN (WEST GERMANY).
The Enrichment of Heavy Metals in Submerged Plants,
W72-14629 5C

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J.; AND COLUMBIA UNIV., NEW YORK.
City Planning and Political Values,
W72-14884 6E

S. S. COLL., ALIPUR (INDIA). DEPT. OF BOTANY.
Studies on Physiological Ecology of Borreria Articularis (Linn. F.) F. N. Will: A Common Weed of Bajra (Pennisetum Typhoides (Burm. F.)) (Stapf. et C. E. Hubb.) Fields,
W72-14861 3F

SAINT FRANCIS XAVIER UNIV., ANTIGONISH (NOVA SCOTIA). DEPT. OF BIOLOGY.
Perception of Polarized Light by Yearling Sockeye Salmon (Oncorhynchus Nerka),
W72-14689 8I

SAN JOAQUIN COUNTY ADVISORY PLANNING ASSOCIATION, STOCKTON, CALIF.
Comprehensive Water and Sewerage Study.
W72-14447 6A

SARGENT AND LUNDY, CHICAGO, ILL.
Thermal Discharges - An Overview,
W72-14399 5G

SCHLUMBERGER WELL SERVICES, EVANSVILLE, IND.
Well Log Applications in Coal Mining and Rock Mechanics,
W72-14831 8D

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
Total CO2, C-13, and Dissolved Oxygen -0-18 at Geosecs II in the North Atlantic,
W72-14355 2K

Petroleum Hydrocarbons: Uptake and Discharge by the Marine Mussel Mytilus Edulis,
W72-14683 5C

SCRIPPS INSTITUTION OF OCEANOGRAPHY, SAN DIEGO, CALIF. MARINE PHYSICAL LAB.
Sedimentation and Erosion on Horizon Guyot,
W72-14961 2J

SECRETARY OF THE INTERIOR, WASHINGTON, D.C.
Underwater Storage Tank,
W72-14994 5D

SENATE, WASHINGTON, D.C.
Stockholm Conference on the Human Environment,
W72-14774 6G

SHEFFIELD UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Meandering Habit of Supraglacial Streams,
W72-14231 2C

SHEFFIELD UNIV. (ENGLAND). DEPT. OF LANDSCAPE ARCHITECTURE.
Studies Along the Edge of a Lichen Desert,
W72-14873 5C

SHELL OIL CO., NEW YORK.
The Role of Rock Strength Anisotropy in Natural Hole Deviation,
W72-14481 8E

SIGNAL COMPANIES. (ASSIGNEE).
Process for Purification of Oil Production Waste Water,
W72-14977 5D

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Dispersion of Pollutants in the Coastal Waters of the Southeastern United States,
W72-14651 5B

SLOVENSKA AKADEMIE VIED, BRATISLAVA (CZECHOSLOVAKIA). USTAV HYDROLOGIE A HYDRAULIKY.
Separation of Hydrograph Components,
W72-14722 2E

Hysteresis of Flux-Gradient Relations for Saturated Flow of Water through Clay Materials,
W72-14736 2G

SMITHSONIAN INSTITUTION, WASHINGTON, D.C.
The Problem of Isolation in the Lowland Tropical Rain-Forest,
W72-14853 4A

SOCIETA ANOMIMA ELETTRIFICAZIONE S.P.A, MILAN (ITALY); AND POLITECNICO DI MILANO (ITALY).
Behavior to Wind Action of Angle and T Bars on H.V. Lattice Structures,
W72-14243 8C

SOCIETE D'ETUDES CHIMIQUES POUR L'INDUSTRIE ET L'AGRICULTURE, PARIS (FRANCE).
Water Treatment Apparatus,
W72-14967 5F

SOCIETE OMYA (FRANCE).
The Method of Sedimentation of Hydrocarbons Used at the Time of the 'Torrey Canyon' Disaster: The Nautex Hydrophobe, (La Methode De Sedimentation,
W72-14653 5G

SOIL CONSERVATION SERVICE, JACKSON, MISS.
Eden Watershed, Mississippi (Final Environmental Impact Statement).
W72-14562 4D

SOIL CONSERVATION SERVICE, PORTLAND, OREG.
General Soil Map Lower Pantano Wash Area, Pima County, Arizona - A Special Report with Selected Engineering Interpretations,
W72-14578 7C

SOIL CONSERVATION SERVICE, TUCSON, ARIZ.
Soil Survey of Tucson-Avra Valley Area, Arizona,
W72-14576 2G

SOIL CONSERVATION SERVICE, WASHINGTON, D.C.
Sweetwater Creek Watershed Project, Tennessee (Final Environmental Impact Statement).
W72-14265 4D

National Engineering Handbook, Section 2-Engineering Practice Standards: Part 1, Engineering Conservation Practices.
W72-14364 8D

Winters Creek Watershed, Nebraska (Final Environmental Impact Statement).
W72-14559 4D

SOUTH AFRICAN INVENTIONS DEVELOPMENT CORP. (ASSIGNEE).
Treatment of Sewage,
W72-14968 5D

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF GEOLOGY.
Turbidite Muds within Diatom Ooze off Antarctica: Pleistocene Sediment Variation Defined by Closely Spaced Piston Cores,
W72-14209 2J

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National Water Well Association, Water Well Construction Technology	W72-14475 -- 14518 14830 -- 14834	49
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University of Wisconsin, Eutrophication	W72-14790 -- 14791 14793 14795 -- 14800 14802 -- 14810 14812 -- 14813	20

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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